DOCUMENT RESUME

ED 245 120 CE 039 161

TITLE Shifting Gears. Hands-on Activities for Learning Workplace Skills and English as a Second Language. A Teacher's Handbook.
INSTITUTION Experiment in International Living, Brattleboro, VT.; Save the Children Federation, Inc.; World Education, Inc., New York, N.Y.
SPONS AGENCY Department of State, Washington, DC. Bureau of Refugee Programs.
PUB DATE 83
NOTE 337p.; For a related document, see CE 039 160.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC14 Plus Postage.
DESCRIPTORS Adult Basic Education; Classroom Techniques; Curriculum; Educational Resources; Electricity; Employment Potential; *English (Second Language); *Indochinese; *Job Skills; Job Training; Learning Activities; Lesson Plans; Mathematics Instruction; *Refugees; Secondary Education; *Second Language Instruction; Sewing Instruction; Teaching Methods; Units of Study; *Vocational Education; Woodworking

ABSTRACT

This curriculum handbook uses a hands-on approach to teaching basic skills and language for the U.S. workplace to students who are not familiar with many common tools and procedures. Although designed for Southeast Asian refugees, the curriculum can be adapted for use with other groups, including older adults or young people. The handbook consists of these parts: (1) an introduction that provides information about the training program for refugees that led to the development of the handbook and that explains how to use the handbook; (2) the curriculum, made up of two units, each unit containing 12 activity lessons; and 34 numbers lessons to be used concurrently; (3) a sample lesson plan and a selection of teaching techniques; and (4) an appendix containing supplemental information, such as handouts, technical notes, and lists of materials. Some of the topics covered in the activity lessons include water systems, electrical wiring, using a drill, wiring and soldering, measuring with string, circuits, reducing a drawing, sewing machines, a test light, planning and sawing a cutting board, taking inventory, patterns, using time sheets, sewing a bag, making a terminal board, designing boxes, plumbing diagrams, and making a lamp. (KC)

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SHIFTING GEARS

hands-on activities for learning workplace skills
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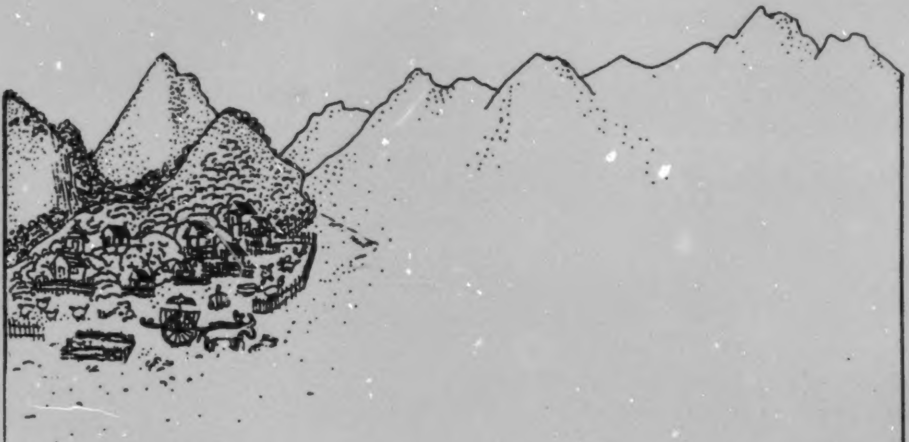
SHIFTING GEARS

hands-on activities for learning workplace skills and english as a second language



a teacher's handbook

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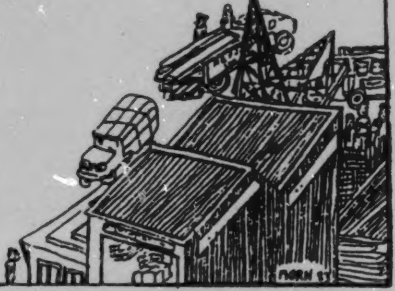

the experiment in international living as part of the consortium

Published by the Consortium: The Experiment in International Living,
Save the Children Federation, Inc. and
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Kipling Road
Brattleboro, Vermont 05301
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The contents of this book were developed under an agreement with the Department of State, Bureau for Refugee Programs. However, these contents do not necessarily represent the policy of that agency, and you should not assume endorsement by the Federal Government.

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Acknowledgements

In 1980, the Experiment in International Living, Save the Children Federation and World Education combined resources to form the Consortium in order to offer intensive English as a Second Language, Cultural Orientation and Pre-Employment training to refugees from Laos and Cambodia. In the fall of 1982, David Hopkins, Technical Program Manager of the Consortium, proposed the development of a teacher's handbook which would reflect the curriculum of the Pre-Employment component of the Consortium training program for Indochinese refugees in Panat Nikom, Thailand.

The Pre-Employment component was specially designed to provide Hill-tribe people--Hmong, Mien, Tin, Tai Dam-- with an introduction to technology found in an industrial society, survival skills needed to keep a job, and related English as a Second Language.

In the spring of 1983, the Handbook Development Project got underway, with Igor Barabash and Marilyn Gillespie as writers and Patrick Moran as editor. Igor and Marilyn compiled and wrote the lessons; Igor did the illustrations; Pat added sections on techniques and lesson planning. Per Christiansen reviewed the lessons to make sure the technical aspects were accurate, and Stephen Amstutz compiled lists and wrote technical notes for the appendix.

Puangtong Boorkham added illustrations for the introduction and the appendix. Pamorn Imkaew did the cover illustration. Charoensak Chongcharueyskul and Chiraporn Ratiwilas provided the photographs.

Orawan Chokasut and Lakana Phongluangtham typed the manuscript. Suchada Fucharoen helped with the lettering.

Also of great help were people from the Pre-Employment training program. The original curriculum development team of teachers, trainers and writers, coordinated by Per Christiansen, designed, wrote, tested and rewrote the lessons that were eventually adapted for the handbook. Jeffrey Nellhaus was responsible for developing, sequencing and refining lessons into a usable format, as was Marilyn Gillespie, who also integrated Vocational ESL into the lessons. Other key members of this team were Horacio Libarona, Holly Forrester, Julie Paloma, Werapong "Udi" Paranone, Mark Preston, Gary Shook, and Greg Williams.

The teachers also helped out with the original lessons and curriculum: George Aye Minn, Nan Boardman, Puangtong Boorkham, Kom Chamrernlaska, Mary Joanne Conway, Somchai Darnsirichaisawad, Phansak Dhechsingha, Ricarte Fedaliyo, Udomsak Glingosum, Eric Heacock, John Hughes, Chatchai Jamavan, Muangpong Juntopas, Marut Jathiket, Noppadol Jennapar, Somkiat Germsak, Sarawanee Jinayon, Naiyana Jiyapong, Pomkasem Kantamara, Rangrak Keskowit, Wipaphan Korkeatkachorn, Sommart Krawkeo, Santi Lekchuvong, Nunthawan Lertsuwanwong, Suparat Lertsuwanwong, Nalinee Mishra, Sunaree Namsing, Tanee Phoohom, Aurawan Potune, Chiraporn Ratiwilas, Tom Riddle, Untana Savanorke, Supol Singhapoom, Cathy Squire, Verawat Suttipun, Jutarat Tansakul, Kemporn Tansamai, Pikul Thonglim, Wannamart Thongtham, Hans van Zoggel, Leendert Visser, Wendy Walker, Chanida Weeks, Richard Weeks, Gregory Wilkins, Nawarat Wongsopa, Jongkon Yantabutr.

Others who offered valuable comments or support: Michele Blatti, David Belskis, Jodi Crandall, Howard Gutow , George and Emily Hein, Carl Hirth, Lynn Savage, Chongrit Sawangpunyankul, Buell Snyder, Bernard Zubrowski and the staff of the Pre-Employment training component, Galang, Indonesia.

Finally, we must acknowledge our debt to those we work with. Our lives have been enriched by the experience we have shared with the refugees in Panat Nikom. This handbook is dedicated to them.

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Introduction

This is a handbook for teachers.

It contains an organized curriculum of lessons, a section on lesson planning and techniques and an appendix of supporting materials. It is designed to clearly show teachers what they have to teach, present ideas for teaching and provide helpful information. Also, the handbook is designed to provide teachers maximum opportunity to decide for themselves how to teach the lessons.

The handbook is for teachers who are teaching the entire curriculum as part of a training program, or for teachers who would like to incorporate a few lessons into an already-established curriculum. Although the primary audience is teachers, program supervisors or teacher trainers may also find this handbook useful.

The curriculum represents a unique hands-on approach to teaching basic skills and language for the U.S. workplace to students who are not familiar with many common tools and procedures. Although designed for Southeast Asian refugees, the curriculum can be adapted for use with other groups, even older adults or young people. The lessons could be incorporated into a vocational training program, or they could provide an interesting supplement to an ESL class.

The handbook consists of four parts:

1. Introduction. This provides information about the training program for refugees that led to the development of the handbook. It also explains how to use the handbook.

2. Curriculum. These are the lessons, presented in two tracks: the core curriculum of Activity lessons and the Numbers lessons.

3. Lesson Planning and Techniques. A sample lesson plan for one lesson in the curriculum is provided. There is also a selection of teaching techniques that can be used in teaching the curriculum.

4. Appendix. This contains supplemental information, e.g. handouts, technical notes, and lists of materials. If you have a limited budget, see the Starting Small section.

Although certain decisions have been made for teachers concerning what to teach, it is up to them to decide how to teach these lessons. Suggestions and techniques are provided, but they have to adapt them to the demands of their particular situation and to the students they are teaching.

Enjoy the handbook!

Background:

The Program in Panat Nikom, Thailand

In a rural village, the rhythm of life is organized by the rising and setting of the sun and the planting and harvesting of crops. Everything needed is produced by hand. Young people watch and listen while cloth is woven, fields plowed and tools made. If they learn a second language they do so by working alongside people from other villages. For them, there is no need for books. They learn by example.

The activities in this book originated as part of a refugee training program for people who came primarily from rural areas in Laos and Cambodia. In the case of the Hmong, Mien, Tai Dam and other Hilltribe people, they had lived outside a world of modern technology.

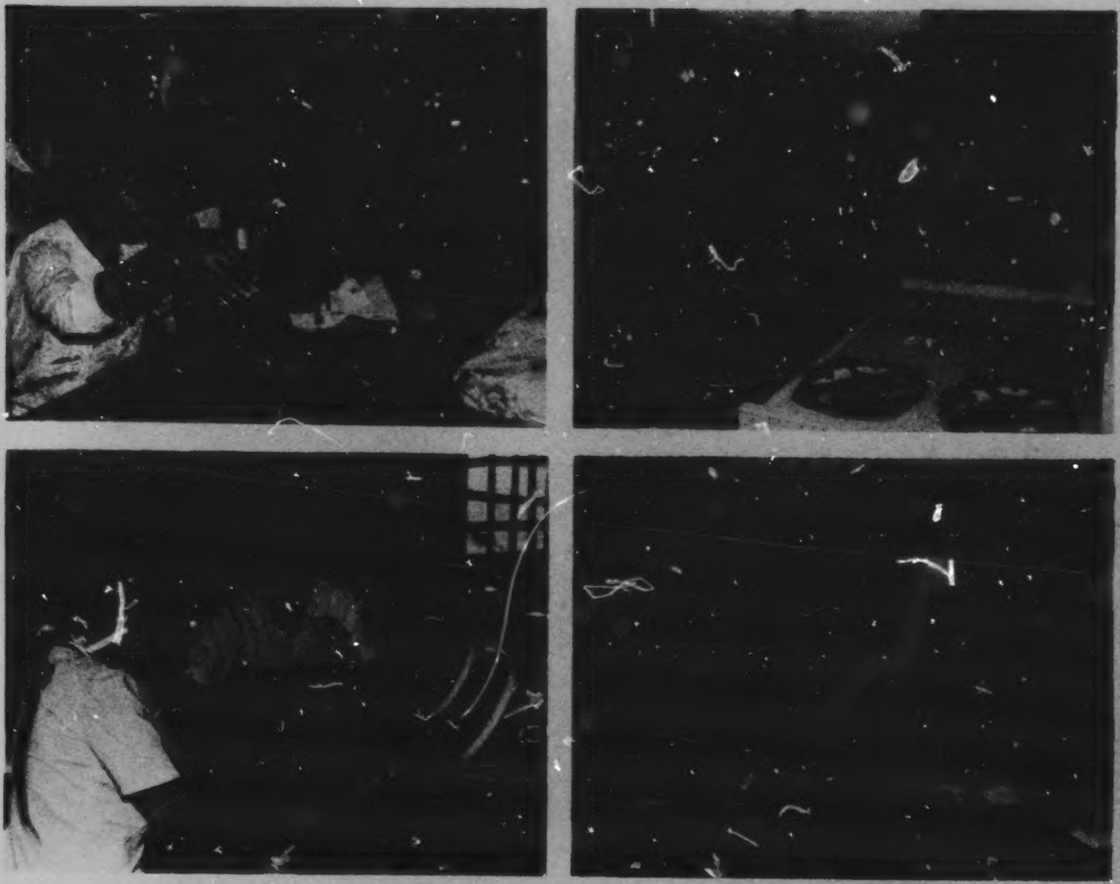
To make the transition from their lives as farmers and craftspeople to life in the U.S., these people needed a specialized curriculum--one which emphasized fundamental skills and procedures necessary to cope with a technologically developed society.

Although many had expert skills at shaping handmade tools and products, they needed to know more about a culture where most things are mass-produced. Many were not familiar with the tools we used in the class, and did not have a sense of a nine-to-five working day. Moving to a fast-paced American urban culture would mean many transitions, but it wasn't long before our students were using watches and calculators, and greeting us in English. We watched them add to their oral tradition an ability to read written symbols--words, numbers and diagrams.

The program created "hands-on" lessons to teach technical, job-related and language skills. It included the apprenticeship learning style with which the refugees were familiar, and simulated the workplace environment they were likely to encounter in the U.S.

Teachers, trainers, consultants and friends were part of months of continual innovation. We gathered materials, exchanged teaching techniques and field-tested the lessons. Since we sometimes had as many as thirty-five teachers working at the same time, we trained in teams simulating step by step the activity as it would be taught in the classroom. Over time we found that an activity can be fun and useful if:

- students have a chance to make choices, resolve problems and find their own best way to do things;
- the skills, language and cultural information are of immediate use, and can transfer to a variety of life experiences;
- there are enough materials so that everyone can be actively involved;
- a spirit of teamwork is part of the process;
- concepts, skills and language move from approximate to more precise, building upon one another.



The lessons here are some of the most popular from the training program. Many more were written. As this handbook goes to press, more new lessons are being developed--more advanced lessons dealing with common grounds and auto electricity, mapping lessons that focus on using alphanumeric codes and coffee shop, hardware store and assembly line simulations. You may want to use these lessons as a model for developing lessons of your own. Perhaps you can locate resources--kitchens where you can teach cooking, a used auto for making basic repairs or friendly job supervisor who can tell you the language refugees need to know. We encourage you to nourish a sense of experimentation and a willingness to try new things.

The Competencies: Language, Culture and Skills

In the next few pages you'll find information to help you get on your way.

There's a description of some of the key objectives, or competencies, of the curriculum and the rationale for choosing them. Several categories of skills such as drawing, woodworking, and electricity interweave and build upon each other throughout the twenty-four lessons, number lessons and the work simulation. The hands-on skills provide the framework upon which the English language and cultural information is based.

All of these--language, culture, and skills are cumulative. They are introduced in one context and later brought back in another--so that by the end of the course your students can sail ahead to complete special projects.

Here's an overview of the curriculum.

Language

Language is the single most important factor that determines whether or not a refugee will remain isolated or become part of his or her new community. It is by far the greatest barrier to successful employment.

Our lessons require students to use only English during the activity. Students who speak no English begin by making physical responses to verbal commands which are combined with gestures and demonstrations using real objects. Each day a small number of new language structures and vocabulary items are introduced through structured practice, dialogues, games and other techniques.

The structures, communicative exchanges and vocabulary have been chosen to be highly transferable and to meet immediate needs. After new language is introduced, it is repeated and reinforced in the hands-on skill activities throughout the course. The goal is for students to develop competence and confidence to make automatic responses to questions and instructions and to initiate language with teachers and classmates.

The language was chosen to reflect what employers say refugees need most to survive in the workplace. The following are the key competencies addressed:

- following and responding to instructions.
- indicating understanding.
- asking for clarification.
- naming and describing items one needs.
- reporting progress.
- asking for assistance.
- giving safety warnings.
- reading and writing numbers, measurements, time and prices.
- reading and writing the alphabet and alphanumeric codes.
- using common language rituals to socialize.

Culture

What are some of a refugee's expectations about working in America and with Americans? The culture section of the lessons provides some thoughts on:

- the importance of communication.
- on-the-job training.
- relationships with supervisors.
- working alone and with a team.
- expectations of co-workers.
- values toward work and time.
- use of schedules and forms.
- safety procedures and warnings.
- manual and problem solving skills.
- applications to home setting.

At times the culture notes may serve primarily as an orientation or focus for the teacher. Other times, there are suggestions which the teacher can use to introduce a cultural topic. Some of these are role plays, open-ended stories, picture interpretations and reflective questions.

The topics were chosen based on research conducted by a variety of refugee support organizations concerning what employers say refugees most need to know.

Employers indicate that what they want most, before hiring refugees, is to be convinced that they will be able to communicate and function independently on the job.

The focus is on keeping a job rather than looking for a job. Sponsors, refugee support organizations and friends, among others, can assist refugees during the job search.

The kinds of jobs available to refugees vary from region to region. Surveys indicate that many will find work in the food service industry, domestic or building maintenance, general factory work, production sewing and electronics assembly. The skill areas chosen for this curriculum, such as sewing, electricity, measurement and construction reflect "pre-skills" needed to function in those jobs. Success at entry level employment will, hopefully, give individuals a chance to obtain jobs in more highly skilled areas when they have more experience.

Skills

Measurement

When asked how he determined the price of a pig, one Lao man replied, "Easy, tie a rope around the pig's belly. The longer the rope, the more expensive the pig." No doubt there are similar rule of thumb methods in the U.S., but for the most part, employers require precise measurements. Short twenty-to thirty-minute measurement lessons introduce concepts that are applied in hands-on projects. They are sequenced to guide students from making measurements without standard tools to internalizing the concept of a base ten numerical system. By the end of the curriculum, students are measuring in centimeters and inches and weighing themselves on a scale.

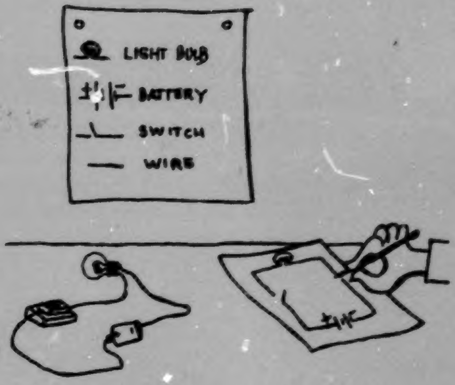
Math

Reading and reporting numbers on forms, making simple computations by adding and subtracting and developing an understanding of the place value system for notation of numbers all are key elements of the math skill area. The first day of class the students explore the functions of a calculator. Over time, they use it during activities to make reliable calculations. Spinner games and other short, open-ended lessons build an understanding of the decimal system and facility in making exchanges using U.S. currency.

Drawings and Patterns

Activities in this area develop visual and spatial perception, the ability to make sense of written symbols and diagrams and some basic elements of literacy. From making simple designs with lines and circles, students progress to using patterns, changing the size of patterns through use of grids, and making three dimensional boxes from two dimensional plans. Later, the skills are applied to reading and making diagrams and patterns as part of woodworking, sewing and electrical projects.

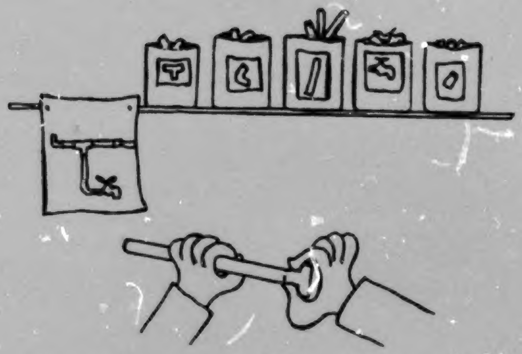
Electricity



Simple electrical systems can seem magical and complicated, even to people who have lived with technology all their lives. Activities in this skill area involve using real equipment to demystify the functions of common household and workplace electrical devices. Students join wire to repair lamp cords and replace plugs and sockets. They gain expertise in using a soldering iron to make electrical connections, following diagrams to make circuits and solving problems with a test light. Integral to these projects is the understanding of insulators and conductors and the role of a switch.

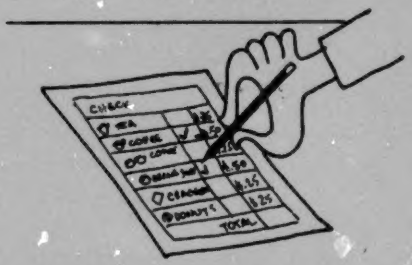
Woodworking and Sewing

These activities give students a chance to gain expertise using hand and electrically powered tools such as drills, saber saws and sewing machines. Students estimate needs, plan tasks and complete projects that give them some elements of choice in deciding the final outcome. They develop a practical sense of the use of standard measurement tools, learn to follow safety procedures and simulate some elements of the workplace.



Systems

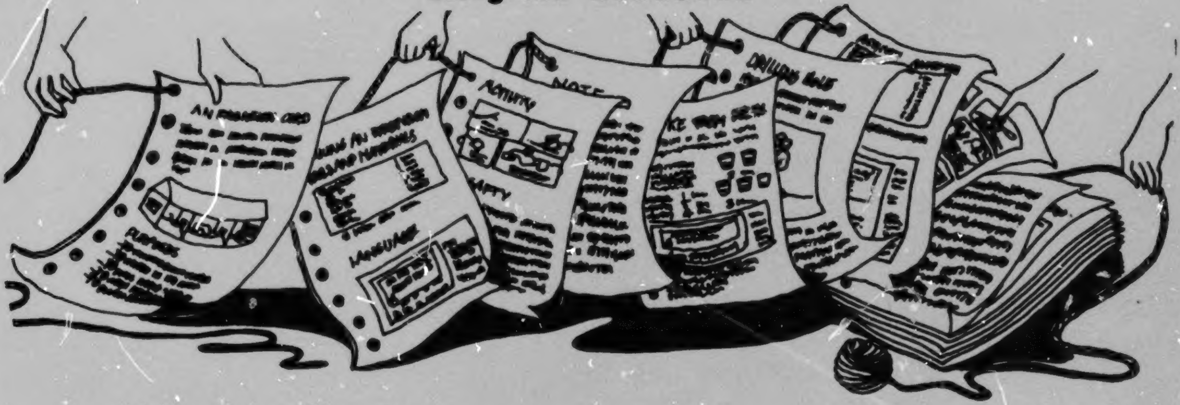
Systems activities cover a range of skills needed to gain access to technology. Students discover the functions of various systems through experimentation. They become acquainted with common ways of classifying and sorting. Some of the activities expose students to piped water systems, building three dimensional pipe systems from a diagram, using a time sheet to keep a record, taking inventory, and using an alphabetical coding system.



A Job Simulation

By role playing one of various employees in a restaurant, students become familiar with common elements of entry-level jobs. This " rehearsal" provides a meaningful context through which students can ask questions about getting along with a job supervisor, clarifying communication in English, and following routines for on-the-job training.

Using the Handbook



The curriculum in this handbook contains two units of skill activities and a series of short numbers lessons which are taught concurrently and lay the foundations needed to measure, count and compute in the hands-on activities. At the end of Unit 2 is a restaurant simulation.

Given a two hour class session, it takes about three weeks to complete a unit. Each unit contains twelve activities. The thirty-four numbers lessons which follow Unit 2 are designed to be integrated at a pace which matches the level of your students. Materials were planned for an average class size of twelve students.

Each activity lesson contains an outline of the key purposes or objectives, a list of tools and materials required, a language focus, a pictoral sequence of the basic steps of the skills activity, cultural or safety information, and a page of teaching suggestions.

Most lessons can be taught in one two-hour session. However, by following the suggestions, almost any lesson can be extended to a two or even three day activity. For example, Using a Drill (Lesson 5) can become a two-day activity by giving your students the experience of preparing and cutting the boards needed in future lessons. You may spend an entire day on a cultural exercise conducted in the native language or setting up role plays for language practice, using English. If your students have little background in numbers, games can be repeated. Simulations can be created to provide work related applications of the skills. The restaurant simulation found in this book, for example, takes four days to complete. Periodic evaluations and reviews to assess students' progress can also be integrated into the program.

Field testers found that the activities became more relevant if they included elements of an actual work environment. As early as possible, students can begin filling in a time card (Lesson 18) and taking inventory of tools (Lesson 15). You can move these activities up in the sequence if your students are ready.

A teacher using this curriculum wears many hats--language teacher, skills instructor, participant in a group process and facilitator for cultural exploration. Your classroom will probably be busy and full of action throughout the two hours, but then, that's the idea. Most field testers found that with careful planning they could include most of the material in the activity and the numbers lessons. There are several support sections to assist you:

Language Structure

At the beginning of each unit, this consists of a condensed checklist of the key language structures and instructional verbs in the unit.

Everyday English

Also at the beginning of each unit, this page has suggestions for general classroom management language and simple small talk for socializing. See page 19 for details about how to use the unit language pages.

Lesson Planning

This section, shows you ways to integrate all the components of an activity through a detailed sample lesson plan.

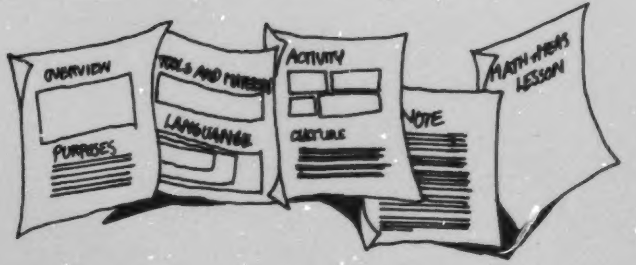
Techniques

This section has a wide variety of techniques to introduce and practice language structures, pronunciation and literacy. There are ways to work with students individually and in groups. Also included are ideas for cross-cultural activities and methods for assessing students' progress.

Appendix

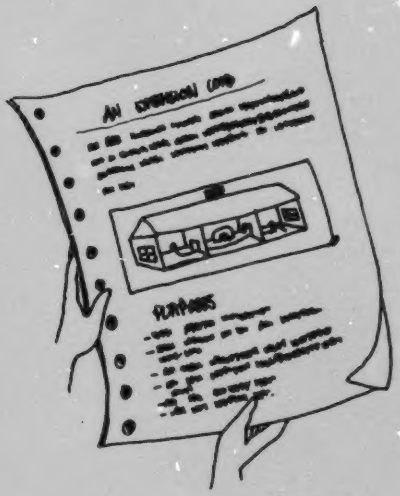
This is a compendium of all the tools and materials you need to set up a program. There are useful notes about buying and preparing materials and technical background about electricity, sewing and woodworking . The "Getting the Most From Your Budget" section discusses, how to modify the program depending on time, money, and numbers of students. The handouts found in the Appendix can be photocopied for use in class.

The Lessons


OVERVIEW
PURPOSES
TOOLS AND MATERIALS
LANGUAGE
ACTIVITY
CULTURE
NOTE
MATH-IDEAS LESSON

Each lesson is four pages long. Page one includes an Overview and the Purposes of the lesson. The second page has a list of Tools and Materials and Language. The steps for the Activity and Culture or Safety notes are on page three. The fourth page contains Notes for the teacher. Numbers Lessons which supplement the skills activity, can be found at the end of Unit 2.

Page One


AN OVERVIEW
PURPOSES

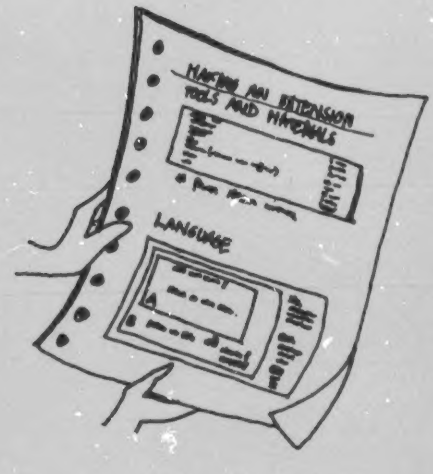
Overview

This tells you at a glance, what the lesson is about.

Purposes

The key skills, language and cultural objectives for the lesson are listed here. This is the "why" of the lesson, necessary to help you plan "how" to teach it. Use the purposes to prepare reviews and evaluations.

Page Two



Tools and Materials

This lists all the equipment you need for the activity. Many times materials need to be prepared before class. If so, you'll see an asterisk (*) at the bottom of the list. If a form is indicated, you'll find a copy in the Handouts section of the appendix.

Language

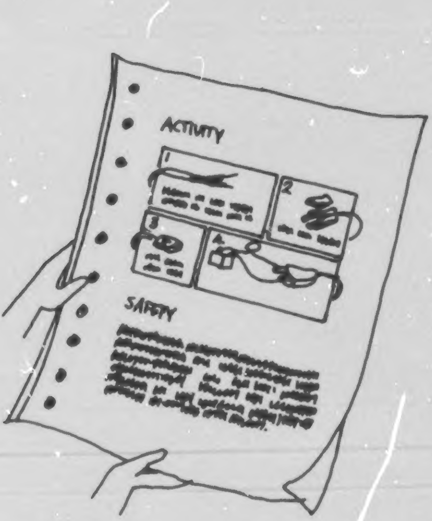
The language focus for each lesson is presented in a box. The A box contains language structures and expressions for beginning students and the B box language for students who have had some exposure to English (low intermediate level). Vocabulary for the lesson is listed in a column on the right-hand side of the boxes. The language listed in the boxes is intended as the primary focus of the lesson, but you may choose to expand this to include other structures and expressions.

Most sentences in the language box have one or more words underlined. Use the vocabulary in the right-hand column to make substitutions. For example, in this sentence,

Give me one wire.	wire wire cutter paper 1-10

you can make variations, such as, "Give me three wirecutters." or "Give me ten papers." Questions and responses are also given with optional responses. Sight words (usually in the form of signs) appear in capital letters (e.g. DANGER, CM). Some language in the right hand column is not underlined. Use it as a guide for giving general instructions.

Page Three



Activity

Here you'll find a series of pictures that illustrate the basic steps to follow to complete the skills activity. There is a brief description of the steps. It's up to you to decide how to teach the activity in the classroom. You can use a discovery approach by showing students a finished product and letting them decide how to make it or demonstrate each step first, and then have students work individually, in pairs or in small groups. (Consult the Tools and Materials list to see how many materials have been specified per student.)

Culture/Safety

These provide information for you to consider about the workplace environment in the United States. There is information about safety procedures, about getting along with co-workers and employers, and about certain jobs. The notes may spark ideas for special activities you can plan. It is up to you to decide how to integrate this information into the lessons.

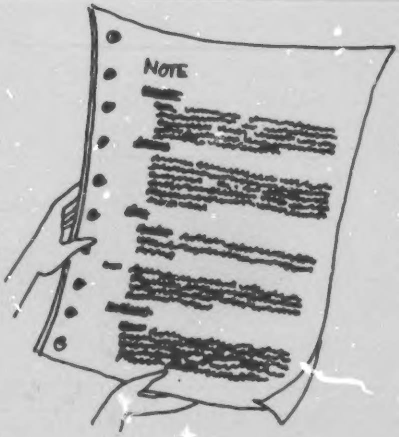
Page Four

Notes

Preparation notes tell you more about the things you'll need to do or make before you teach the lesson and about tools you can add or substitute for the ones in the materials list.

Activity notes have things to watch out for, variations to try, and background notes about technology.

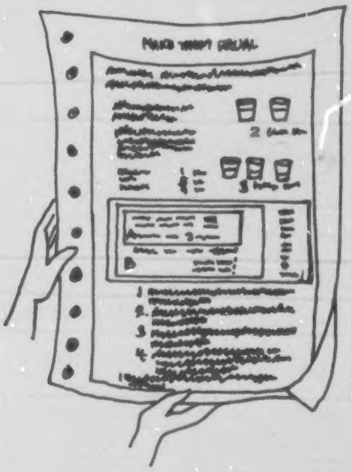
Safety notes point out techniques to avoid hazards, to demonstrate hazards and to use for warnings.



Language notes give you ideas for integrating the language with the activity, suggestions for making language part of the daily routine, useful practices and techniques for evaluation.

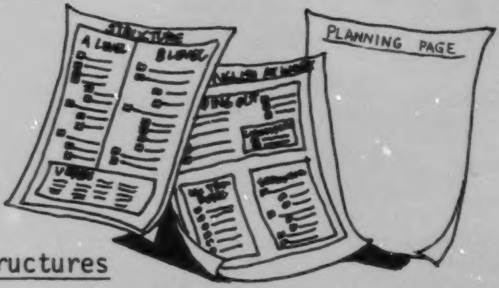
Culture notes include reflective questions, role plays, open-ended stories and other ideas you can try. (You'll need a translator if you don't speak your students' native language.)

Numbers Lessons



These teach prerequisite concepts and skills your students will need to do the skills activities. They follow a careful sequence from basic number recognition, to measuring, understanding equal parts, adding, subtracting and using U.S. currency. We suggest that you do them in sequence, one each day. If you find that your students already understand some of the concepts, you can move ahead quickly. The lessons hold the attention of students at all levels because they are in the form of games. Usually they require about twenty or thirty minutes per lesson, but students may often want to play longer.

Planning a Unit



To assist you in planning, two language related pages and a blank page for sequencing have been included at the beginning of each unit.

Structures

Teachers who use English during the lessons must be able to distill their speech so that it is very simple. A few basic verbs and structures and vocabulary can go a long way toward meeting your communication needs. For example, instead of a long-winded explanation such as, "Would you like to get the round tube in the corner and place it directly into the half-full bucket?" You can get along very well by using gestures and saying, "Go over there. Put the tube in the bucket. Like this."

The Structures page presents a checklist of the key grammatical structures and instructional action-verbs found in each unit. Use it to plan ways to simplify instructions, questions and responses so that students begin to recognize and use them. If you find your students haven't mastered basic language, you can leave out some of the more complex sturctures in order to do additional reviews. (If your students are more advanced, you can consult English as a Second Language texts which will suggest sequences for language expansions.) One good way to expand is by language functions. For example, find more precise ways to ask for help, report progress and give warnings. The language is presented in the form of checklist to help you integrate the structures in the lessons and to organize reviews.

Everyday English

This checklist contains suggestions of common language that could be introduced at almost any point. Instead of keying it to specific lessons, we've left it up to you to decide when and where to include the expressions. The categories "Getting Things Done" and "Finding Out" have some expressions and questions teachers need constantly to accomplish classroom routines. There are simple exchanges beginners can use. The category "Socializing" has language rituals you can use before and after class. Introduce one or two a day and use them on a regular basis. "Going Further" has some recommendations for short role plays. You'll notice there is plenty of room to add or substitute expressions that work for you.

Planning Page

After the two language planning pages is a blank page you can use for planning the sequence of your Activity and Number Lessons, and for special activities.

Unit 1

Structures

A LEVEL

GIVING INSTRUCTIONS

Open	+	the	+	box
Verb		a/an		object

Give	+	me	+	the box
Verb		him her		object

Open	+	this
Verb		that it.

Don't	+	open	+	here
Negative		verb		location

Put	+	the box	+	here
Verb		object		there over there

B LEVEL

Open	+	the box	+	and	+	cut		it.
Verb		object				verb		object

Give	+	me	+	the box.
Verb		us them		object

Open	+	this.
Verb		these those them

Give	+	the box	+	to me.
Verb		object		to him to her

YES/NO QUESTIONS

Is this a box?	Yes, it is. No, it isn't.
Are these boxes?	Yes, they are. No, they aren't.
Is this hot? cold on off	
Is this bigger? smaller longer shorter	Yes, it. No, it isn't.
Are they safe? clean dirty dangerous	Yes, they are. No, they aren't.
Is this the biggest? smallest longest shortest	Yes, it. No, it isn't.
Whose is bigger?	His is bigger. Hers is bigger. ____'s is bigger. name

QUESTION WORDS

What is this?	It's a box.
Which one is bigger?	This one. That one.
Where is it?	It's in the box. on under next to
How many boxes?	One. Two. Three. Four. Five. Six. Seven. Eight. Nine. Ten.
Which one is the biggest?	That one is the biggest.
Where is it?	It's in front of the box. in back of on top of beside behind
How many are there?	There is one. There are two.
Are there two?	Yes, there are. No, there aren't.
Is this big or small?	It is small.

Verb

give (me)*
show (me)*
hand (me)*
pass
get
pick up
put
take
do
make
open
close
lock
draw
copy
cut
fold
unfold
turn on
turn off
plug in
unplug
connect
measure
tighten
loosen
thread
sew

*require on indirect object

Everyday English

Add your own related language for each category.

FINDING OUT

Are you ready?

Yes, (I'm ready)
No, (Wait a minute, please.)

Do you understand?

Yes, (I do)
No, again please.

Are you finished?

Yes, (I'm finished.)
No, (Not yet.)

Is everything OK?

Yes, (Everything's OK.)
No, (Can you help me?)

Tell him to ______.
her verb

Ask him to ______.
her verb

Answer him.
her.

GOING FURTHER

A. Can you help her?
B. Excuse me?
A. Help her.
B. Just a minute, please.
Sure
Sorry, I can't.

GETTING THINGS DONE

Take a break.
Clean up.
Be careful.
Watch out!
Listen!
Come here.
Go over there.

SOCIALIZING

Hello. (Hi.)
How are you?

I'm fine.
I'm sick.

What's your name?
My name's ______.

Where are you from?

I'm from ________.

Are you married?
Yes, I'm married.
No, I'm single.

What language do you speak?

I speak ________.

Do you have any children?

Yes, I do.
No, I don't.

See you later.
Goodbye.

Planning Page

Lesson 1

Water Systems

How is water carried from one place to another? In this lesson, students design a basic plumbing system using flexible tubes, tees, faucets and buckets.

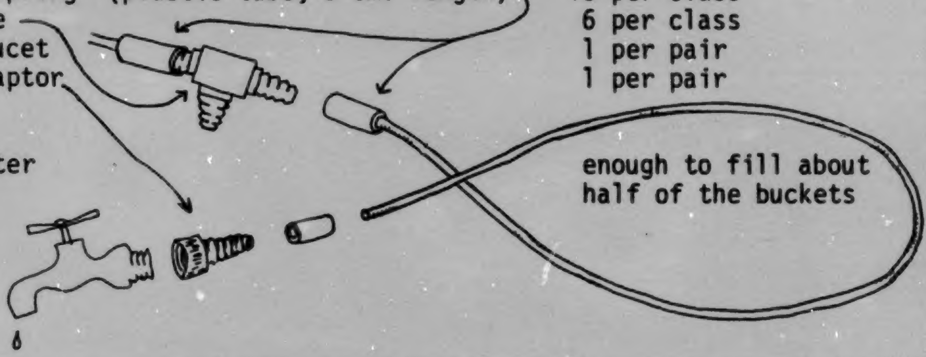
Purposes

- To use basic plumbing parts.
- To plan and make a plumbing system.
- To follow instructions to perform a task.
- To ask for the names of tools and materials.
- To work as part of a team.

1 Water Systems

Tools and Materials

large bucket	1 each
small bucket	1 per pair
bottle	1 per pair
plastic tube, about 1 cm. outside diameter, (2 m. length)	9 per class
coupling* (plastic tube, 8 cm. length)	15 per class
tee	6 per class
faucet	1 per pair
adaptor	1 per pair
water	enough to fill about half of the buckets



* preparation required before class

Language

A

What's this? / that? — It's a/an bucket.

Pick up the bucket.
Give me the bucket.
Put the bucket here.

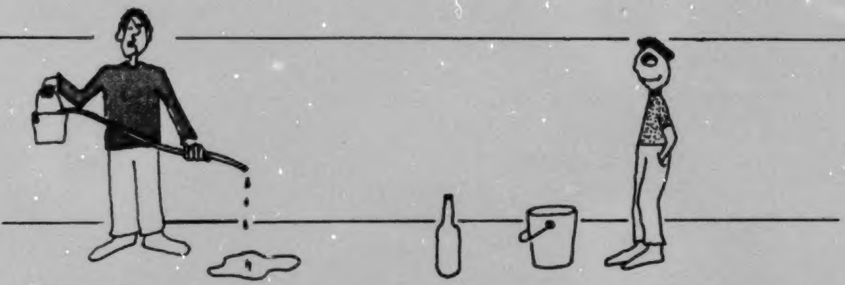
B

What are these? / those? — They are buckets.

bucket
tube
water
adaptor
faucet

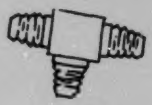
Activity

1



Using a plastic tube, find ways to make water flow from one bucket into another; into a bottle; from a bottle.

2

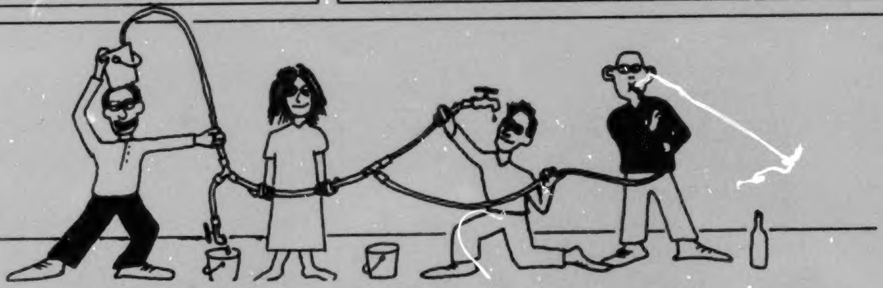


Find ways of adding a tee to your system.

3

Find ways of adding a faucet and an adapter to your system.

4



Add another faucet and adapter to your system. Try out different possibilities.

Culture

Every 'modern' home has two water systems. One carries in clean water and the other carries out the used water. This prevents health problems since clean and dirty water never mix.

Moving to a new place means getting familiar with new systems for doing things. How was water obtained in your students' previous home?

Notes

Preparation

Coupling. Use a coupling to attach the tubing to the tees and adaptor. You need couplings because the tees and adaptors are for use with garden hoses, which are too large for this activity. The coupling is made from larger plastic tubing, which has an inside diameter that is the same as the outside diameter of the smaller tubing.

Activity

Allow students to experiment with ways of transferring the water from the buckets using only the tubes. Then, give them tees, and later, faucets.

An option is to work alongside the students as a participant or "helper" instead of directing the process.

Language

Presentation. Pass around the tools so that students can examine and handle them in silence. Then give them the names.

Demonstration. Present the demonstrative pronouns by placing some objects near you ("this, these") and others farther away ("that, those"). Use these pronouns instead of the names of tools.

Action Sequence. Give the students instructions to perform actions with the tools and materials (e.g. "Pick up the faucet.") which they carry out. Vary this by placing objects around the room so that students have to leave their chairs to carry out instructions, or by directing them to put the objects in unusual places, e.g. under a desk. As a follow-up, point to objects and mime the action; students give the appropriate instruction.

Question-Answer Practice. Place the tools and materials on a table. Put a question mark on the blackboard. Point to the question mark to signal that students ask, "What's this?" Point to an item to signal the response, e.g. "It's a tube." Continue until all students have participated.

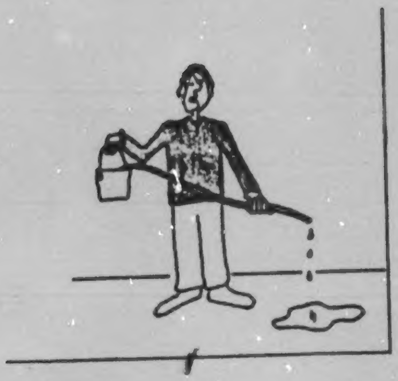
Cultural Exploration

Picture Interpretation. Show students pictures of various ways water is transported in rural and urban settings in the U.S. Allow them to make statements about what they see in the pictures. Have them make comparisons with the way water was transported in their homes.

Planning

1 Water Systems

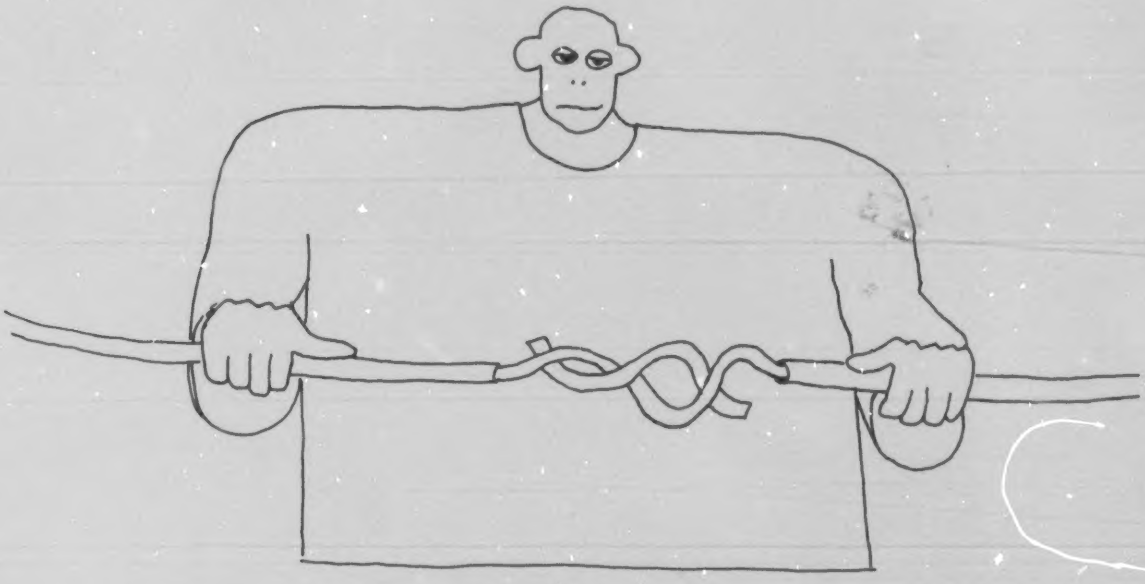
Planning



Lesson 2

Connecting Electrical Wire

Wire is found in lamps, radios, extension cords, and countless other household appliances that use electricity. This lesson introduces basic skills in working with electrical wiring. Students strip and join wires together, tape them, and attach the free ends to screws.



Purposes

- To strip the insulation, join and tape two pieces of wire.
- To attach ends of wire to two screws.
- To use a screwdriver and a razor knife safely and effectively.
- To give safety warnings in English.
- To make and respond to a request for a tool or material.

2 Connecting Electrical Wire

Tools and Materials

razor knife with protective cover	1 each
screwdriver	1 each
wire cutter	1 per class
plastic tape	2 rolls per class
bell wire* (10-50 cm.)	2 each
lamp cord, split into single insulated wires* (10-50 cm.)	2 each
wood block with 2 sheet metal screw terminals* (block size: 2x6½ cm. x 15 cm. length)	1 each

*preparation required before class

Language

Give me the razor knife.
him
her

Open the razor knife.
Lock
Close

Be careful! It's dangerous.

A

Give us the razor knife.
them

B

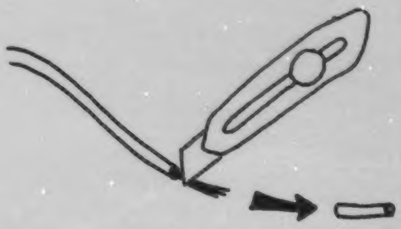
razor knife
screwdriver
screw
wire

give me
show me

DANGER

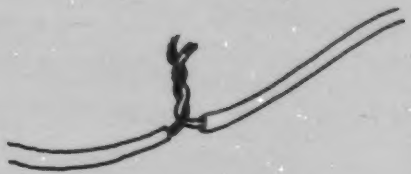
Activity

1



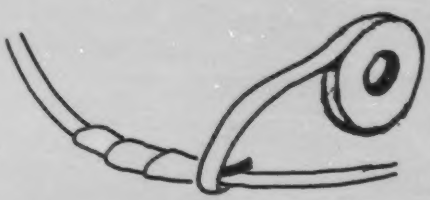
Take 2 wires. Strip all 4 ends with a razor knife.

2



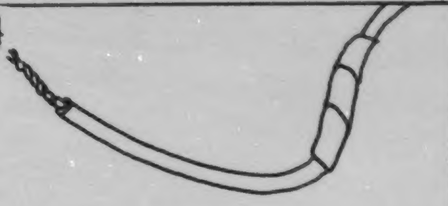
Join 2 ends by twisting the wires together.

3



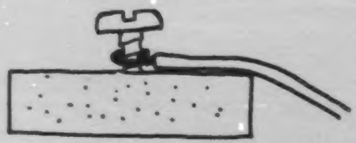
Cover the joined ends with tape.

4



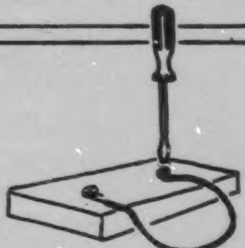
Twist one end of the wire.

5



Bend it and put it under the head of a screw, clockwise around the screw.

6



Tighten the screw. Do the same with the other end and the other screw.

Culture

Many appliances in the home and machines in the office or factory run on electricity. It is the fundamental form of energy for modern technology. Although electrical equipment and its use seem mysterious, it can be understood. After a few lessons with simple materials some basic properties of electricity can be observed through experimentation. This will help students develop a greater confidence to operate equipment safely.

Notes

Preparation

Terminals. The first time you do this activity, make wood blocks, each with two screw terminals. Use sheet metal screws, since the bottom side of the heads of these screws is flat and will hold the wire securely. (See illustration: Activity step 5).

Wire. Cut the lampcord wire to the lengths you desire. Then split it into two single, insulated wires. Start with a knife, then pull the wires apart by hand. Buy wire that is reasonably easy to strip. Remember that you can re-use the wire by cutting off the stripped ends. (See Appendix: Electricity.)

Tape. Use plastic "electrician's" tape, which is thicker and does not crack with age. This makes it safer than ordinary plastic tape.

Sight Words. Words in capital letters in the language box indicate sight words. You can prepare signs before class, or use the blackboard.

Safety

Show students how to use a razor knife safely. Lock the blade in place for use and push it into the protective cover when it is not in use. Do not pass the knife with the blade facing the receiver. Use warning expressions ("Be careful!" and "It's dangerous!") as you demonstrate. Put a safety sign DANGER on the wall.

Language

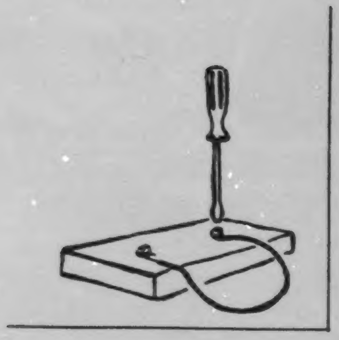
Ask For It. Prepare a set of cards with pictures of the tools and materials; put an assortment of tools and materials on the table. Students turn over a card and must ask for the item they see on the card (e.g. "Give me the razor knife"). Other students must give them the item. Vary this by adding symbols for "him" and "her" on the card.

Conversation. Begin class with a short "free conversation" periods, where you ask your students questions about their lives. Each day repeat questions from previous lessons. Have students ask each other--and you. See the Everyday English section for possibilities.

Planning

2 Connecting Electrical Wire

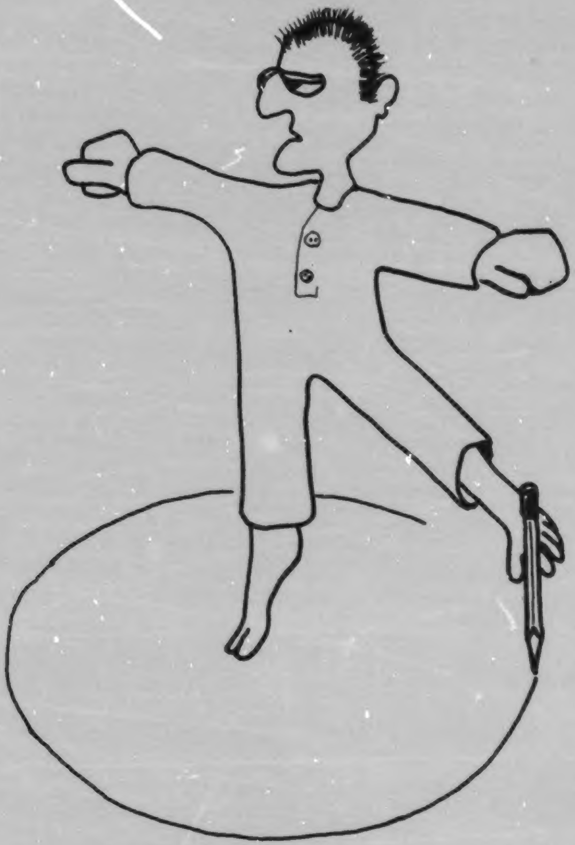
Planning



Lesson 3

Lines and Circles

In this lesson students use a straight edge, pencil and compass to make simple designs with lines and circles--the basic shapes found in diagrams and in the letters of the English alphabet.



Purposes

- To plan and make a design.
- To use a pencil, straight edge and compass.
- To draw straight lines, curved lines and circles using unfamiliar tools.
- To express understanding of instructions.
- To ask for clarification or repetition of instructions.

3 Lines and Circles

Tools and Materials

straight edge	1 each
compass	1 each
pencil sharpener	1 per class
pencil	1 each
eraser	1 each
plain paper	3 sheets each

Language

Put the pencil here.
there.
over there.

Draw a line.

Do you understand? Yes, I do.
No, I don't.
Again, please.

A

Draw a line and show it to me.
him.
her.

Do it again, please.
Say

B

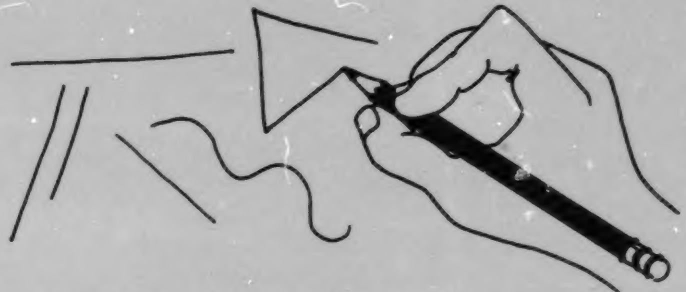
pencil
paper
compass
straight edge.

line
circle

give me
show me

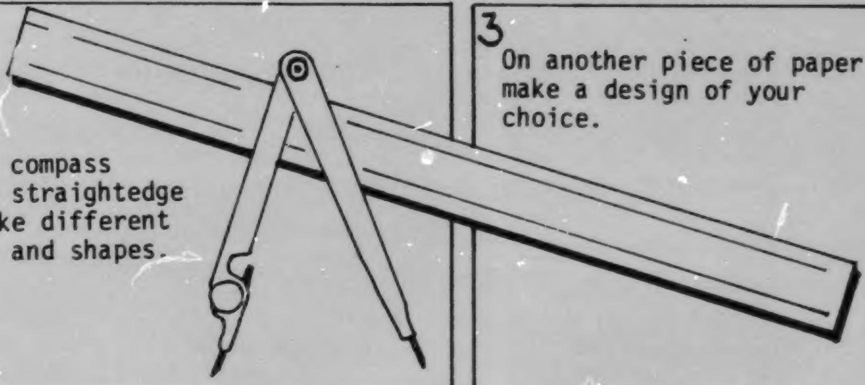
Activity

1



Use a pencil to make different lines and shapes.

2



Use a compass and a straightedge to make different lines and shapes.

3

On another piece of paper make a design of your choice.

Culture

Employers in the United States are concerned that refugee employees usually do not ask questions when they do not understand something. They may end up working on their own without the help and support that a supervisor or co-workers could give.

3 Lines and Circles

Notes

Preparation

Rulers. If you use rulers instead of straight edges, and if students are confused by the markings, cover the markings with masking tape.

Shapes. Advanced classes can draw and cut out the geometrical shapes for Lesson 6. Use cardboard or poster board. (See Appendix : Handouts.)

Activity

If necessary, show students how to hold a pencil. Grip the pencil close to the tip with the thumb and two fingers. Rest your wrist flat on the table for support.

Language

Situation. To present "I don't understand," deliberately mumble an instruction so that students are unable to hear or understand it. Then ask, "Do you understand?" and elicit the response, "No, I don't." Follow this with a clear instruction and ask the question again, this time eliciting, "Yes, I do."

Remember Where. Put an assortment of tools, and materials in three places in the classroom ("here, there, over there"). Give students time to study the three places, then gather the objects in another place. Students must give you instructions to put objects back in their original place (e.g. "Put the compass over there").

Rituals. Begin a routine of expecting your students to verbally respond to instructions and questions. Encourage them to answer in complete sentences (e.g. "They're pens," instead of "pens."). Also establish predictable verbal exchanges with students to give them practice. For example, encourage responses to instructions:

"All right."
"Draw a line." "OK."
"A what?"

Cultural Exploration

Open-Ended Story. Tell students a story about an employee who doesn't understand instructions that his supervisor gives him. As a result he makes many mistakes in his work. His co-workers get upset and his supervisor gets angry. Have students give their opinions on what the supervisor and the employee should do.

Planning

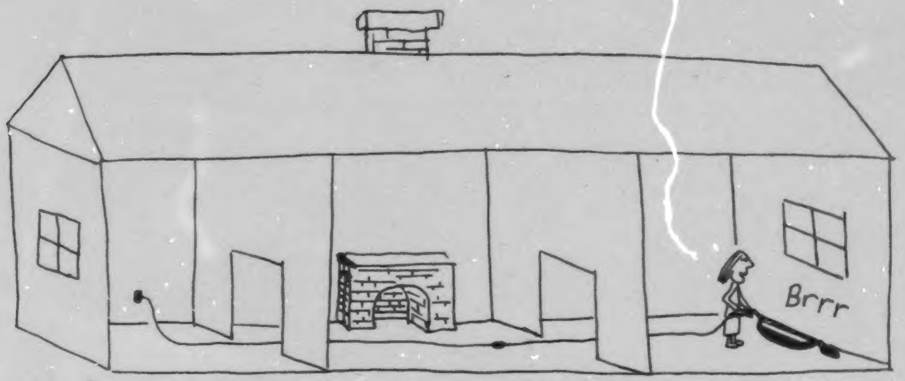
3 Lines and Circles

Planning

Lesson 4

Extension Cords

In this lesson students make an extension cord using lampcord, a plug and a socket. They test to be sure it is safe, and then use a lamp with it to see if it works. They use these extension cords in lessons to come.



Purposes

- To apply skills of joining wire.
- To take apart and put together something that has a nut and a screw.
- To name and identify parts of an extension cord.
- To report "how many" answering with numbers from one to ten.
- To identify some safety hazards.

4 Extension Cords

Tools and Materials

razor knife	1 each
screwdriver	1 each
wire cutter	2 per class
plug	1 each
socket	1 each
lampcord* (various lengths up to 2 meters)	1 each
test light*	1 per class
lamp	1 per class

* preparation required before class

Language

How many wires? One wire.

Plug in the extension cord.

A

How many wires are there? There is one.
are two.

B

wire
screwdriver
razor knife
extension cord

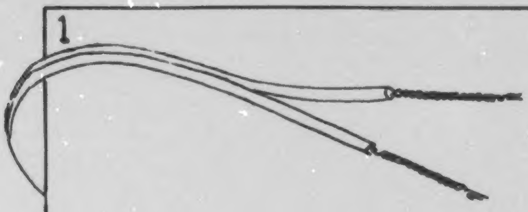
plug in
unplug
pick up
show me

1-10

DANGER

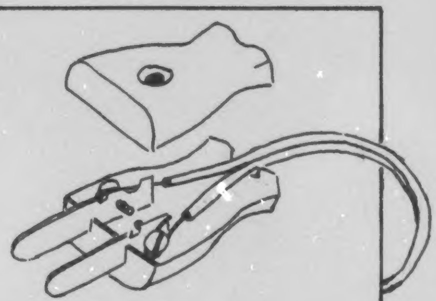
Activity

1



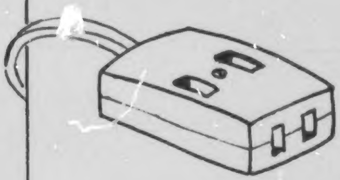
Choose a length of lampcord.
Strip and twist the ends.

2



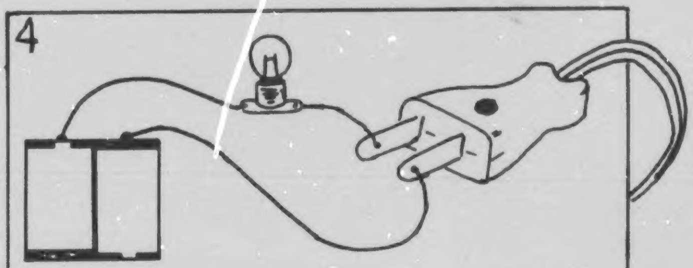
Attach a plug to one end.

3



Attach a socket
to the other end.

4



Use a test light to check the plug for a short circuit. Touch one wire of the test light to one prong, the other wire to the other prong. If the bulb lights, you have a short circuit.

Safety

At home or at work there are general safety practices to follow when using electrical appliances. Appliances should never be used near water. Electrical sockets should not be overloaded. Appliances with frayed wires should not be used. It's a good idea to unplug any appliance before examining it. Children should be kept away from electrical outlets.

4 Extension Cords

Notes

Preparation

Lampcord. The first time you teach this lesson, cut the lampcord into 1½-2 meter lengths. When you teach the lesson again, take apart the extension cords students have made. Cut off the stripped ends and reuse the wire.

Test Light. You will need a test light for this activity. To find out how to make one, see Lessons 9 and 12.

Activity

See the Lesson Planning section for options in teaching this lesson. Encourage students who are having problems making their extension cords to watch someone who is doing it correctly. After students have finished their extension, show them samples of ones which were especially well-made.

Safety

Short Circuit. To show students how dangerous electricity can be, demonstrate a short circuit using an extension cord (see Appendix : Electricity).

Establish a routine of taking an inventory of tools and materials with the students at the beginning and at the end of class. See Lesson 15 for a sample inventory form and suggestions for incorporating it into lessons.

Language

Spinners. Put an assortment of tools and materials on the table. Use a spinner board and Spinner Card 1 (numbers 1-9) and a set of flash cards with pictures of the tools and materials. Students turn over a card and spin the arrow. They then take that number of the item on the card. Students ask and answer question (e.g. "What's that?" "How many?"). (See Appendix: Handouts for tool flashcard cut-outs.)

Long Answers. Use structures with "there is" and "there are" for more advanced students and add additional conversational language (e.g. "How many are there in your family?"). Have them answer in complete sentences.

Planning

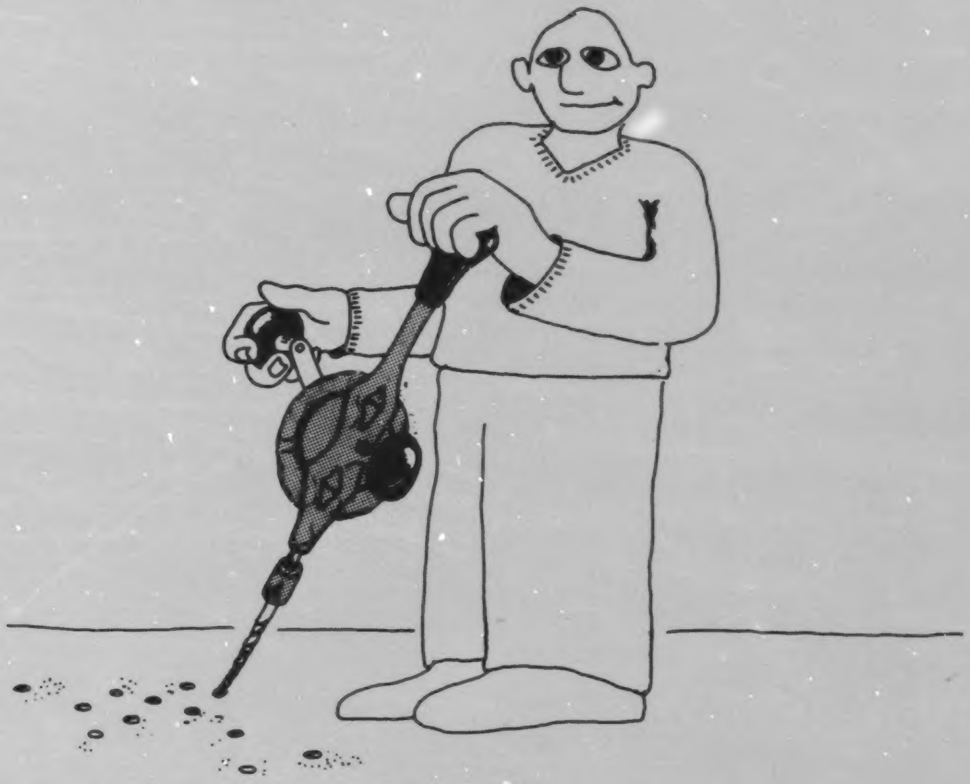
4 Extension Cords

Planning

Lesson 5

Using a Drill

Students use a hand drill to make holes in two pieces of wood. They then use a screwdriver to attach them together with wood screws.



Purposes

- To demonstrate safety procedures in using a hand drill.
- To develop judgement in selecting the right size drill bit for the job.
- To give and respond to cautions using "don't."
- To discuss direct and indirect ways of giving warnings and instructions.
- To work independently to complete a task.

5 Using a Drill

Tools and Materials

hand drill	1 each
set of drill bits	1 per pair
extra bits (sizes that often get broken)	8-10 per class
countersink drill bit	2 per class
screwdriver (appropriate size for screws)	1 each
hand saw	1 per pair
"C" clamp (6" or 8" size)	1 per pair
pencil	1 each
masking tape	1 roll per class
screw, flathead wood (3 cm.)	2 each
extra screws (in case heads become stripped)	6-8 per class
wood board (2x6.5 cm. x 37 cm. per student)	1 each
scrap pieces of wood (for clamping and optional drilling practice)	1 each
bench hook (can be made in this lesson)	1 per pair
sample of two pieces of wood screwed together*	1 per class

*preparation required before class

Language

What's this? It's a drill bit.
the drill bit.

Take a drill bit.
Don't take a drill bit.

Be careful!

A

Watch your fingers!
Look out!

B

drill bit
drill
screwdriver
screw

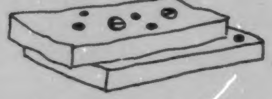
take
give me

tighten
loosen

DANGER

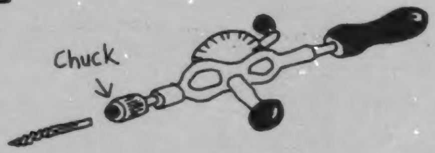
Activity

1



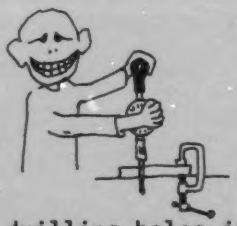
Look at a sample of two pieces of wood held together with wood screws. Take them apart.

2



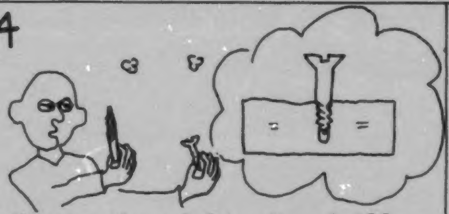
Put a drill bit into the chuck of a hand drill.

3



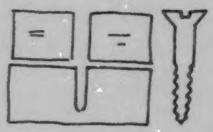
Practice drilling holes in your own two pieces of wood.

4



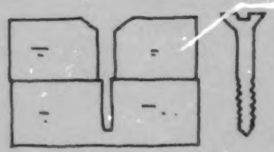
Choose the right size drill bit to drill the proper size hole for the threaded part of a screw to bite into.

5



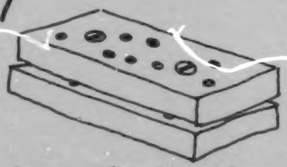
The unthreaded part of the screw needs a bigger hole. Drill the holes.

6



Enlarge the opening of one of the holes so the head of the wood screw fits below the surface of the wood.

7



Screw the two pieces of wood together. Keep trying drill bit sizes until you are satisfied that you know which sizes of holes are best.

Culture

Working independently is an important feature of the U.S. workplace. Many jobs involve people working alone, instead of in groups. Employers tend to value employees who do not require a lot of supervision or direction. Such employees are able to work effectively on their own and rely on themselves.

What kinds of jobs did your students do on their own in their countries?

5 Using a Drill

Notes

Preparation

Wood Pieces. Mark and cut the pieces of wood for this lesson. You can do this yourself, or have students do it. Have students cut the pieces in 18.5 cm. lengths (they can use a sample piece to measure and mark their boards with). An additional tool needed is a square (1 per pair) to mark the lines for cutting (see Appendix: Woodworking).

Sample Product. This consists of two pieces of wood (6.5 x 2 x 18.5 cm.) screwed together. Drill lots of extra holes so the sample resembles the product students will finish with.

Activity

Demonstrate the use of a bench hook to secure wood for sawing. If you have not made bench hooks yet, use a piece of wood to protect the table while drilling.

Use two sizes of drill bits, one for the board with the unthreaded part of the screw and the other for the board with the threaded part. Then use the countersink bit where the head of the screw will go.

A few drill bits will break. Stop the students if you see that the drill is not straight or is moving side to side. This movement can break a bit (see Appendix: Woodworking for drilling techniques).

Language

Simon Says. Distribute sets of four to five tools or materials to each student. Give a series of instructions (e.g. "Pick up the drill" or "Show me the screw"). Students must respond only to instructions preceded by "Simon says". Give students a mark if they don't follow instructions correctly. Vary this by including instructions with "don't."

Hans' Game. Gather some tools and materials used in the previous lessons. Divide the materials into two identical groups, each on one side of the room. Put the students into two teams. Call out a command (e.g. "Put the pencil in the bucket"). One student from each team runs to a group of tools and materials and performs the action. The one who finishes first gets a point for the team.

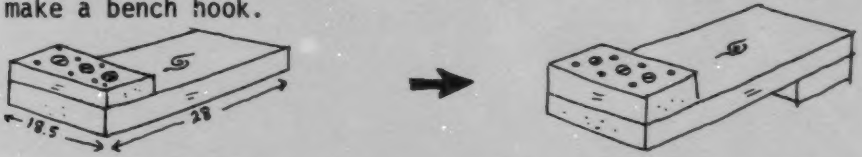
Notes

Cultural Exploration

Role Play. Relationships between supervisor and employee are important. It's not uncommon for supervisors in the U.S. to speak loudly (even angrily) to employees when giving instructions or warnings. Have students do a role play where the employee makes a mistake and the supervisor responds in a loud voice. Discuss the role play and appropriate responses.

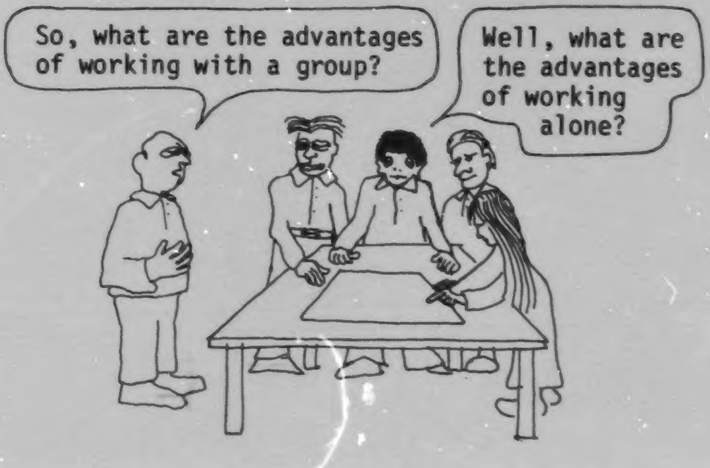
Special Variation

Bench Hook. At the end of this lesson, instead of attaching the pieces of wood together, attach them to a larger piece to make a bench hook.



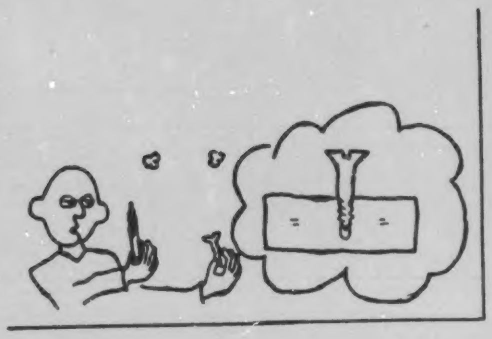
Each student needs to cut a 28 cm. piece from an 2 x 18.5 cm. board. Use three screws to attach one of the small pieces of wood to the end of the 28 cm. piece. Attach the second piece to the other end. Additional materials:

board (2 x 18.5 cm.)	1 per student
screw, flathead wood (3 cm.)	6 per student
square	1 per pair
sample bench hook	1 per class


So, what are the advantages of working with a group?
Well, what are the advantages of working alone?

5 Using a Drill

Planning



Lesson 6

Designs

In this lesson students arrange basic geometrical shapes to make a design. Then, using a compass and straight edge, they copy their design on a separate piece of paper.

Purposes

- To independently plan and construct a design.
- To use and name basic geometrical shapes.
- To transfer the design as accurately as possible using a straight edge, compass, and pencil.
- To answer "Yes" and "No" questions indicating the location of an object.
- To report when a job is finished.

6 Designs

Tools and Materials

straight edge	1 each
compass	1 each
pencil sharpener	1 per class
pencil	1 each
eraser	1 each
plain paper	3 sheets each
cardboard shapes*: triangle, rectangle, square, and circle	5 each

*preparation required before class

Language

A

Is this a/an circle?	Yes, it is. No, it isn't.
Is the circle on the square?	Yes, it is. No, it isn't.
Are you finished?	Yes, I am. No, not yet.

B

Is the circle in front of the square?
in back of
on top of
beside

Yes, it is.
No, it isn't.

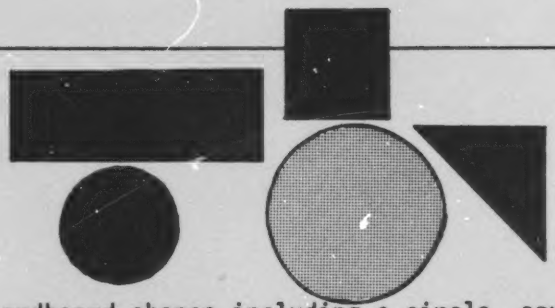
circle
triangle
rectangle
square
eraser

on
in
under
next to

draw
put
copy

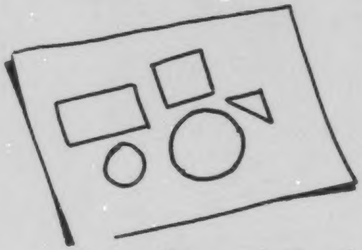
Activity

1



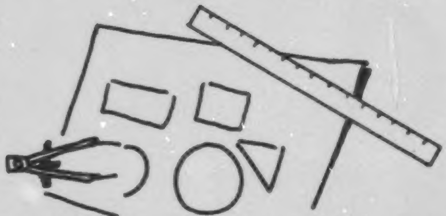
Take five cardboard shapes including a circle, square, triangle and rectangle. Arrange them on a piece of paper to form a design.

2



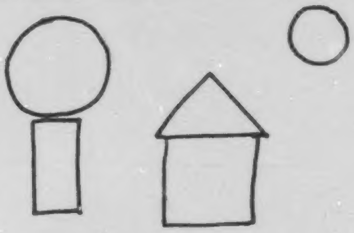
Trace the outline of the design.

3



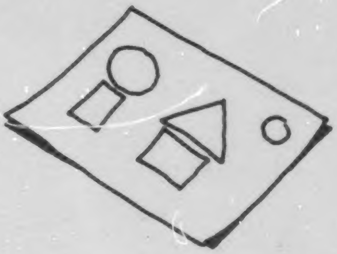
Copy the design on another piece of paper using a straight edge and a compass.

4



Arrange the pieces differently.

5



Do the activity again.

Culture

A Hilltribe woman's status in her village and chance for marriage are often determined by her expertise in fine embroidery. Other villagers can know about a woman's character and events in her family by the colors and designs she chooses. This ability to do precise and detailed work are transferable skills that can help women from rural backgrounds to get jobs in the United States.

6 Designs

Notes

Preparation

Shapes. Each student should receive a set of five shapes--a triangle, a square, a rectangle, a circle and one other of these shapes. Use various colors and sizes in making the shapes (for samples, see Appendix : Handouts).

Activity

Provide colored pens, pencils or crayons for students to color their designs when they have finished.

Invite students to cut out their designs and glue them to a large piece of poster board to make a group collage.

For advanced classes, have students think of additional geometrical shapes made from lines and circles (hexagons, trapezoids, pentagons) and draw these on the blackboard.

Language

Find That Shape. Have students work in pairs, sitting back to back. One student gets a cardboard shape. The other asks Yes-No questions to find out what it is (e.g. "Is it a triangle?" "Yes, it is," or No, it isn't."). For advanced classes, add more shapes and have students find out where they are placed (e.g. "Is the triangle on the square?").

Do The Same. For advanced classes, have students work in pairs, each with the same set of shapes. One student places the shapes on the page to make a design and gives the other instructions to make the same design (e.g. "Put the square next to the triangle.").

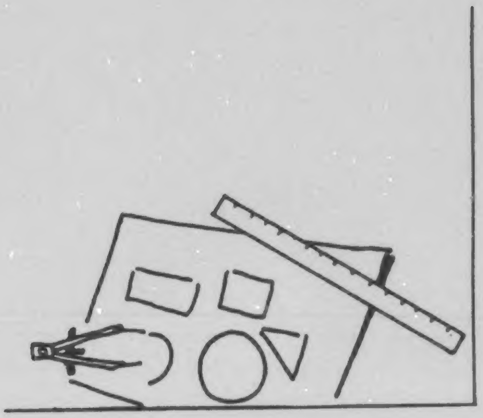
Cultural Exploration

Design Interpretation. Because of their cultural backgrounds, students may perceive shapes and spatial relationships in different ways. To examine differences, ask students to use the shapes to represent particular topics (e.g. a flower, a tree, a dog, a landscape scene). Ask students to make comparisons of their designs. If possible, bring in examples of designs of the same topic by people from other cultures.

Planning

6 Designs

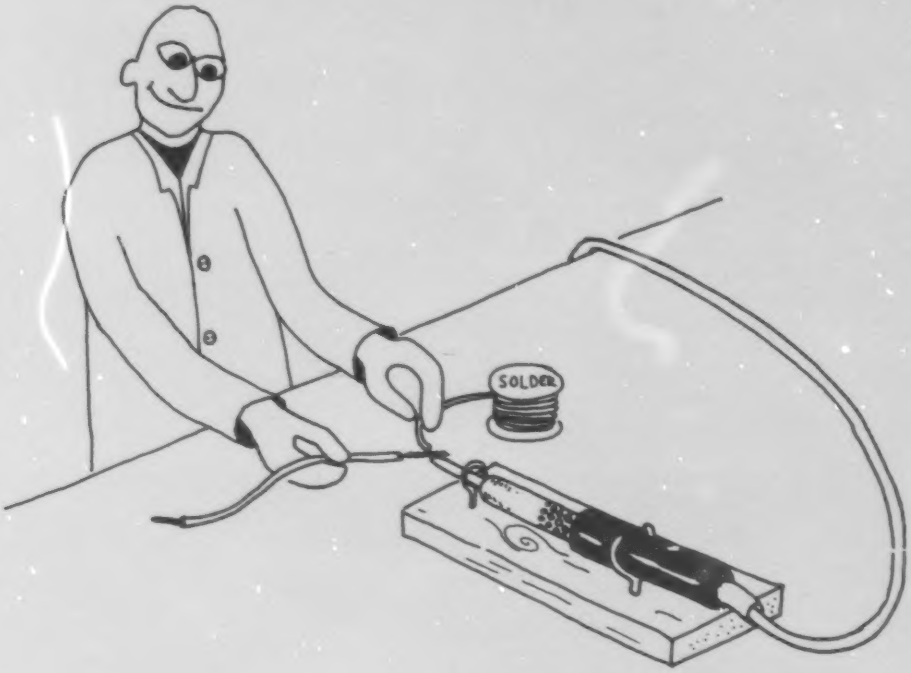
Planning



Lesson 7

Wire and Solder

In this lesson, students learn how to melt solder onto wire, called "tinning" wire. Tinned wire is easier to solder to other pieces of metal, such as terminals, and is used in later lessons. A key focus of this lesson is the safe handling and care of the soldering iron, an electrical tool which gets very hot.



Purposes

- To apply solder to stripped ends of wire, using a soldering iron.
- To follow instructions to maintain and care for a soldering iron.
- To set up a safe working situation.
- To use the extension cord.
- To respond to Yes-No questions about the quality and condition of tools.

7 Wire and Solder

Tools and Materials

Soldering Kit, for each class to include:	
soldering iron	1 per student
soldering iron holder*	1 per student
solder	1 box per class
flux	4 containers/class
sponge (wet in a container)	
tool to tighten soldering iron tips, usually a Phillips screwdriver	1 per class
razor knife	1 per pair
wire cutter	3 per class
long nose pliers	3 per class
metal file	1 per class
wire scraps* (10-50 cm. long, possibly from Lesson 2)	4-5 pieces each
extension cord (students made in Lesson 4)	1 each

*preparation required before class

Language

Hand me the soldering iron.
him
her

Is it hot? Yes, it is.
No, it isn't.

A

Are they safe? Yes, they are.
dangerous? No, they aren't.
clean?
dirty?
finished?

B

soldering iron
screwdriver
wire
razor knife

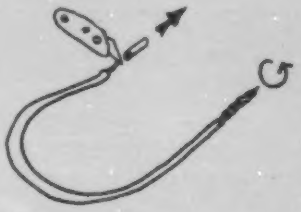
hand me
pass me
get me

hot
cold
on
off

ON
OFF

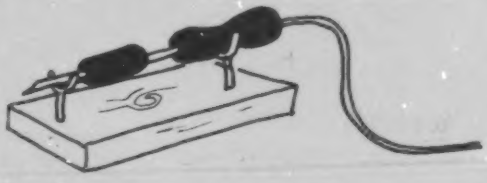
Activity

1



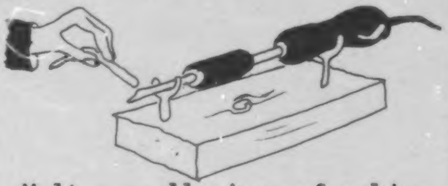
Strip the wires with a razor knife. Twist the ends.

2



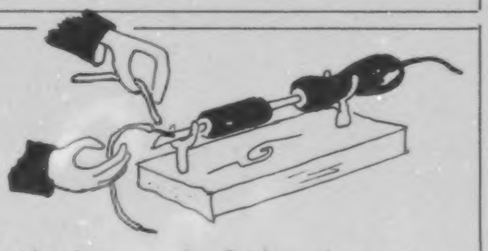
Plug in the soldering iron. Put it on the soldering iron stand to heat up.

3



Melt a small piece of solder onto the tip of the soldering iron.

4

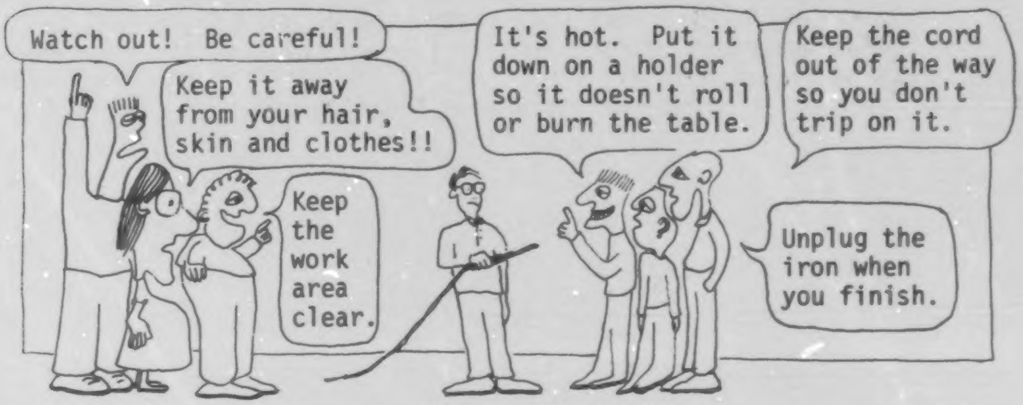


Lay the bare end of the wire onto the tip. Add more solder if needed until it melts onto the heated wire.

5

Practice tinning several pieces of wire. Remember, the wire must be hot - not just the solder.

Safety


Watch out! Be careful!
Keep it away from your hair, skin and clothes!!
Keep the work area clear.
It's hot. Put it down on a holder so it doesn't roll or burn the table.
Keep the cord out of the way so you don't trip on it.
Unplug the iron when you finish.

7 Wire and Solder

Notes

Preparation

Holders. Buy soldering iron holders, or make them like those in the illustration in the activity. You can also make holders from used china plates or pieces of flower pots.

Activity

Here are a few important points about soldering:

- Be sure the wire gets hot enough to melt the solder. Otherwise, the solder doesn't coat the wire, and drops of solder fall on the table.
- If the wire seems hot enough, but the solder won't stick to it, dip the wire in the flux.
- Clean the soldering iron tip with a metal file only when necessary. A file can wear down the tip. To clean the tip, stick it into a sponge. Then apply a little flux and a coating of solder to the tip.

(For safety procedures on soldering, see Appendix: Electricity.)

Safety

Hazards. Show students the results that can occur if you don't follow safety procedures. Use pictures or mime actions (e.g. a hole burned in the table, a fire or a burned finger or arm).

Picture Interpretation. Bring in pictures of people working at various jobs, some of them safely and others not. Have students interpret the pictures, stating which are safe, which are not and why.

Language

Question-Answer Practice. On the table, put an assortment of soldering irons in various "states" (e.g. on, off, clean, dirty, safe, dangerous). Point to a soldering iron and ask a question (e.g. "Is it hot?"). Students give the appropriate answer (e.g. "No, it isn't hot, but it's safe and clean.").

Planning

7 Wire and Solder

Planning

Lesson 8

Measuring with String

Making a hat, or any other item, to meet a specification requires measurement. In this lesson, students design hats to fit their own heads. They use string as a simple measuring device and compare head sizes by creating a bar graph.

Purposes

- To make linear measurements using a measuring tool which does not have numbers or equally spaced markings.
- To compare lengths of cord which indicate head size.
- To design and construct a paper hat.
- To make and use a bar graph as an evaluation tool.
- To answer questions about comparisons in length and size.
- To ask for advice or assistance.

8 Measuring with String

Tools and Materials

straight edge	1 each
compass	1 each
scissors	1 each
pencil sharpener	1 per class
pencil	1 each
eraser	1 each
magic marker	1 per class
masking tape	1 roll per class
thick string (non-stretching)	20 meters per class
newsprint	2 sheets per class
poster paper	4 sheets per class
sample paper hats of different sizes*	2-3 per class

*preparation required before class.

Language

Which one is big?	This one. That one.
Can you help me?	Sure. OK. Just a minute, please.

A

Whose is bigger? smaller? longer? shorter?	John's is bigger.

B

one
cord
hat
pencil
paper
straight edge

big
small
long
short

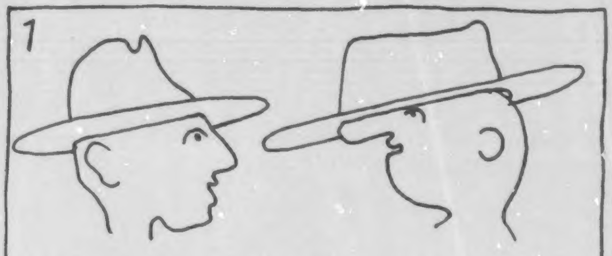
John's
name of a
person

measure
draw
cut

8 Measuring with String

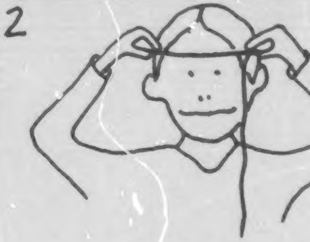
Activity

1



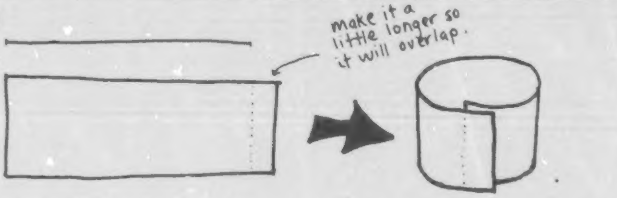
Try on the sample paper hats. Do they fit you?

2



Measure the size of your head with a string.

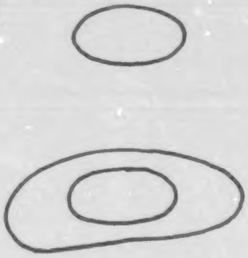
3


make it a little longer so it will overlap.

Use the string to measure the length of paper you need to make a hat that will fit your head.

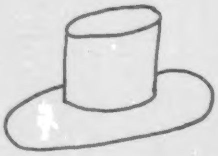
Curl the paper and tape the ends together.

4



Cut out a top and a brim for the hat.

5

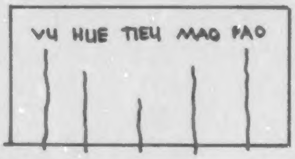


Tape the pieces of the hat together.

6

Tape your string to a piece of newsprint. Write your name above the string

7


VU HUE TIEU MAO FAO

Compare the lengths of the different strings.

Culture

Making measurements without a standardized system of measurement is common--both at work and at home. A clerk in a hardware store measures wire by using the edge of a table. A janitor puts a soup can of soap concentrate into half a bucket of water. This kind of measurement is more accurate than estimating, even though there are no "units" of measurement.

What systems of measurement have your students used?

8 Measuring with String

Notes

Preparation

String. Be sure you buy string which doesn't stretch when you pull on it, since this can change the measurement.

Sample Hat. Prepare a number of hats, each a different size and a different style. Encourage students to make theirs differently.

Activity

Remind students to make the length of the paper longer than the length of the string, so there can be overlap for gluing.

If time permits, have students use the string to measure their waists (or another part of the body). Have them make a bar graph.

Language

Comparisons. Collect a variety of objects (books, chairs, tools, etc.) and put them in the front of the room. Point to 2 objects and elicit a statement of comparison (e.g. "That one is bigger.") from the students. Vary this by having students ask questions (e.g. "Which one is bigger?").

Chart Practice. Use the bar graph as a basis for questions and answers (e.g. "Whose is longer?" "Lee's is longer."). For advanced classes, vary this by asking them to give a 30-second "spiel" (talk) based on the information in the chart.

Ritual. Having students help you to prepare before class is an informal way to practice simple language rituals. Have students memorize and practice rituals to turn on lights or fans, clear tables or get materials ready. The Everyday English page has some suggestions.

Characters. As a follow-up, have students create an "identity" for the person who wears their hat (name, age, occupation, residence, etc.). Have them put their hats on and introduce themselves to the rest of the class. Vary this by having students role play meetings between their characters.

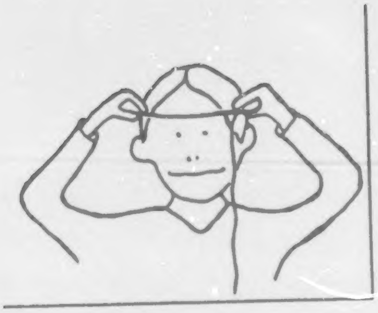
Cultural Exploration

Depiction. Ask students to describe how they measured things in their home country. Invite them to demonstrate how they made certain measurements. Some may prefer to make drawings.

Planning

8 Measuring with String

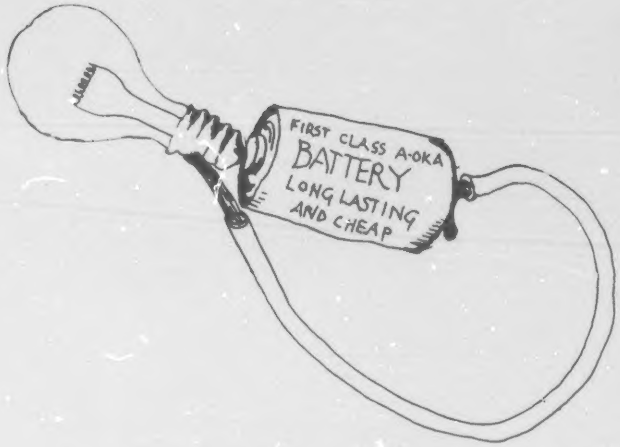
Planning



Lesson 9

Circuit with a Bulb and Battery

Students make a basic electrical circuit with a battery, a light bulb and a wire. They make diagrams showing the various ways they try connecting these parts. This is the first lesson involving an electrical circuit.



Purposes

- To solder wire to the terminals on a light bulb socket.
- To make a simple circuit.
- To draw diagrams of circuits.
- To show which circuits worked and which did not and to draw conclusions.
- To ask about or tell the location of an object.

9 Circuit with a Bulb and Battery

Tools and Materials

Soldering Kit (Lesson 7)	1 per class
razor knife	1 per pair
wire cutter	3 per class
metal file	1 per class
long nose pliers	3 per class
pencil	1 each
eraser	1 each
plain paper	1 each
battery, 1.5 volts (size to fit battery holder)	2 each
battery holder (for 2 batteries, with 1 red and 1 black wire)	1 each
light bulb, 2.5 volts (size to fit socket)	1 each
wire* (with stripped ends, 15-30 cm. long, possibly from lesson 2)	1 each
extension cord (Lesson 4)	1 each
light bulb socket	1 each

*preparation required before class.

Language

Where is the wire? It's on the table.

A

Is the wire on the battery or
on the table?

It's on the table.

Connect the battery and the wire.

B

wire
battery
soldering iron
bulb
cutter

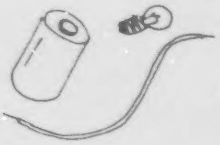
on
under
next to
in

turn on
turn off
connect

9 Circuit with a Bulb and Battery

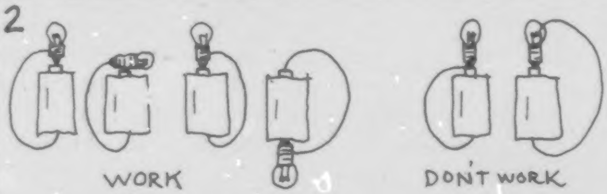
Activity

1



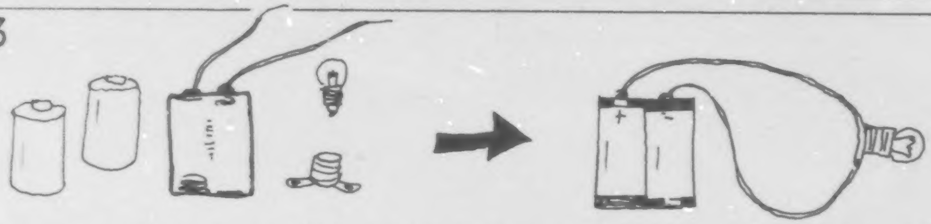
Take one battery, one wire, and one light bulb. Make the bulb light up.

2



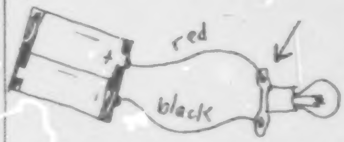
Draw pictures showing ways that work and ways that don"t work.

3



Take 2 batteries, a battery holder, a light bulb, and a light bulb socket. Arrange the materials so that the light bulb will light up. (See Notes.)

4

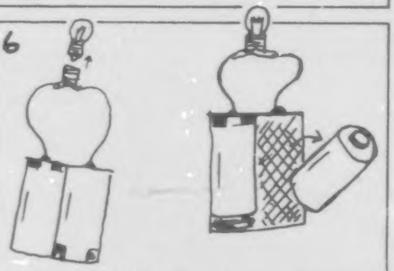


Solder the red wire to one terminal of the light bulb socket. Solder the black wire to the other terminal.

5

Draw a picture of your circuit on a piece of paper.

6



Find at least two ways to break the circuit.

Culture

Connecting batteries to operate electrical or electronic equipment is a useful skill. Knowing how to use a soldering iron could lead to work in the electronics industry.

At home, understanding the correct method to install batteries is important. Radios, tape recorders, and other appliances only work if the batteries are put in according to the + and - symbols indicated on the machine.

9 Circuit with a Bulb and Battery

Notes

Activity

Allow plenty of time for students to find ways to light the bulb. Some students may prefer to work on their own, while others may learn from watching. Have students draw their solution on the blackboard. Encourage them to find additional ones.

If there is time, give each student another wire, and have them find ways to light the bulb using one battery and two wires.

If you buy battery holders that have terminals (instead of two wires coming out), the students can solder a 15 cm. piece of wire onto each terminal. If possible, use a red wire for the positive (+) terminal, and a black wire for the negative (-) terminal, because these are the colors associated with positive and negative.

Language

Memory Table. Put a few tools, materials and other objects on the table--in, on, under and next to each other. Describe their location. Then have the students ask and tell each other where the items are. Cover the table with a cloth, and ask students to say where the items are.

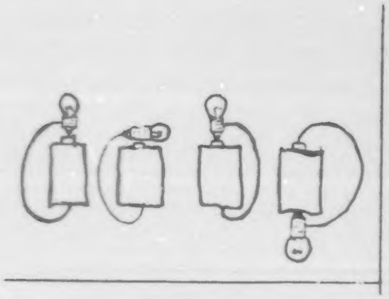
Hide It. Have one student leave the room so that the others can hide a tool somewhere in the classroom. The student returns to the classroom and tries to find the item by asking Yes-No questions (e.g. "Is it under the table?").

Spiel. Have students give a short talk, where they describe the circuit they have drawn to the rest of the class. As a follow-up, post the drawings and have students identify whose they are.

Planning

9 Circuit with a Bulb and Battery

Planning

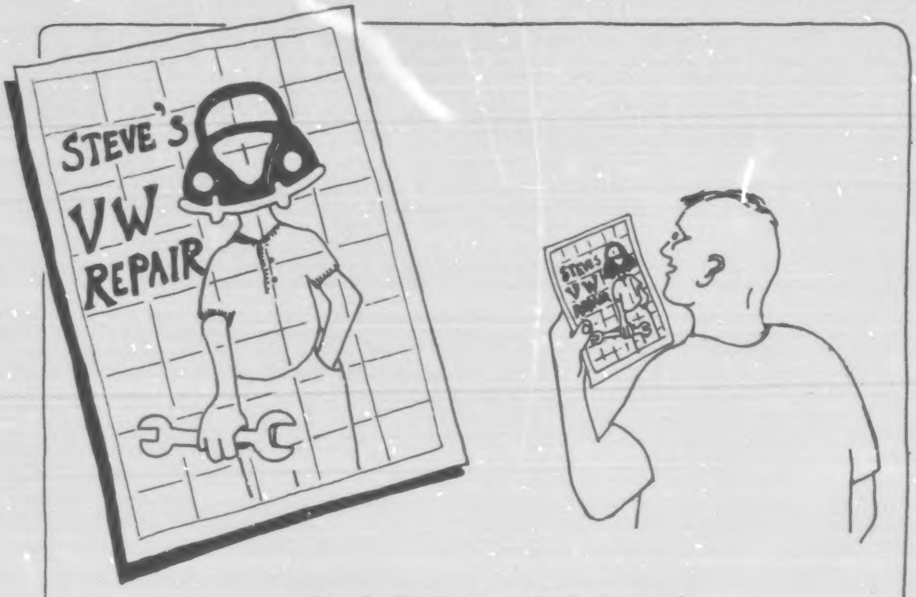


86

Lesson 10

Reducing a Drawing

How can you alter a pattern to make it bigger or smaller? In this lesson students make a design and then transfer it to grid paper. They use a grid with smaller squares to reduce the size of the design.



USING A GRID TO MAKE A SIGN

Purposes

- To plan and construct a design using flat geometrical shapes.
- To transfer the design to grid paper.
- To reduce the design precisely, using smaller grid paper.
- To make statements and answer questions about comparisons of size.
- To develop skills in using plans and patterns.
- To report when one is ready to begin a task.

10 Reducing a Drawing

Tools and Materials

straight edge	1 each
scissors	1 each
pencil sharpener	1 per class
pencil	1 each
eraser	1 each
plain paper	1 sheet each
cardboard shapes*: triangles, rectangles, and squares (used in lesson 6)	5 each
grid paper* (1.5 cm. squares)	1 sheet each
grid paper* (2 cm. squares)	1 sheet each

* preparation required before class.

Language

Which square is bigger? This one.
That one.
Make it bigger.

Are you ready? Yes, I am.
No, not yet.

A

Which square is the biggest?
smallest?

This square is the biggest.
smallest.

B

square
triangle
rectangle

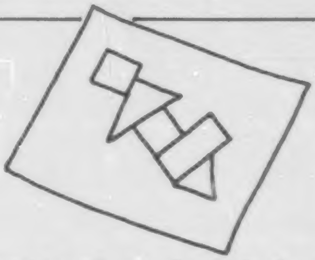
bigger
smaller

make
copy
draw
cut

10 Reducing a Drawing

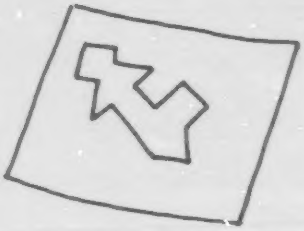
Activity

1



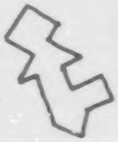
Arrange 5 cardboard shapes on a piece of paper to make a design.

2



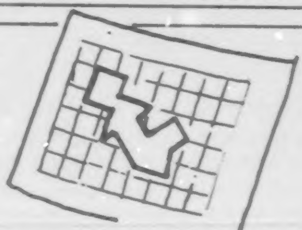
Trace the outline of the design onto the paper.

3



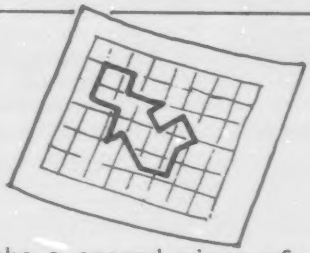
Cut out the design.

4



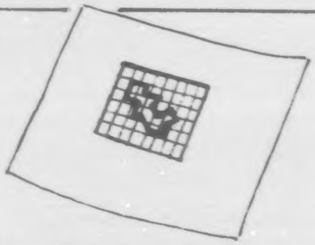
Trace the outline of the design onto a piece of grid paper.

5



Take a second piece of grid paper and copy your design by using the squares as a guide.

6



Transfer your design onto grid paper with smaller squares. Use the squares as a guide.

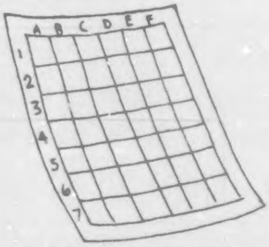
Culture

In very large factories, parts for the production line are made elsewhere and arrive ready for use on the assembly line. In smaller, specialized factories, some parts have to be made right in the factory. Generally patterns are used to do this. Designs for the patterns are usually produced from paper or wood and later the product is cut from wood, metal, cloth or plastic. Sometimes various sizes of the same pattern will be made by enlarging or reducing.

10 Reducing a Drawing

Notes

Activity



Some students may have trouble locating the same square on each of the two sizes of grid paper. To avoid confusion, they can label the squares (not the lines) with numbers and letters.

For beginning students, delete circles from this activity, since they can be too difficult to copy.

Give students colored pencils or crayons. It is easier to see the difference in size of the two finished designs when they are colored in.

Advanced students can draw more complex designs freehand--without using the cardboard shapes or the straight edge.

Language

Put It There. Have each student label a separate piece of grid paper with letters and numbers. Call out locations (e.g. "B3."). Students put a dot in the center of that square. Call out other locations. Finally, have the students draw lines to connect the dots. They give the names of the geometrical shapes they have drawn (triangle, square, rectangle, etc.).

A B C
A
2
3
A B C
1
2
3

Work Stations. As a review, set up six work stations, where there are simple tasks to do (drilling a hole, tightening a screw, sorting red bottlecaps from black ones, etc.). Assign one student "supervisor" to each station to give the commands to complete the task. The rest of the students go from station to station to complete each task. Have students say certain exchanges at the stations, such as

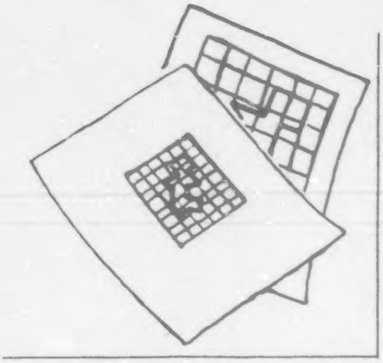
+ Are you finished?

- Yes, I am.

Planning

10 Reducing a Drawing

Planning



Lesson 11

Sewing Machine

This lesson is the first in a series in which the students make things using a sewing machine. Students learn the main parts of a sewing machine and language related to its operation. They learn to control the speed, thread the machine, and practice sewing straight lines.

Purposes

- To prepare cloth for machine sewing.
- To thread a sewing machine.
- To sew a straight line.
- To ask for help.
- To report progress and ask for assistance.
- To identify many objects.

11 Sewing Machine

Tools and Materials

sewing machine	1 per pair
machine sewing needles	6 per machine
bobbins* (threaded)	2 per machine
ruler	1 per pair
tracing wheel	1 per pair
scissors	1 per pair
hand sewing needles	1 each
pins	1 package/pair
pencil	1 each
eraser	1 each
tracing paper	1 package/pair
cloth* (practice pieces, approx. 12 x 24 cm.)	2 each
thread, spool	1 each

* preparation required before class.

Language

What are these? They're needles.

Are these needles? Yes, they are.
No, they aren't.

Is everything OK? Yes, everything's OK.
No, can you help me?

A

How many needles are there? There are two.

Are there two? Yes, there are.
No, there aren't.

B

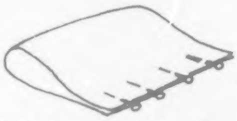
needle
pin
scissors
sewing machine
(spools of) thread

two
three
four
five

fold
sew
thread
cut

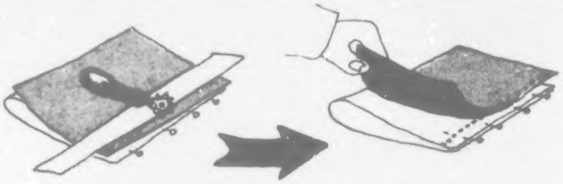
Activity

1



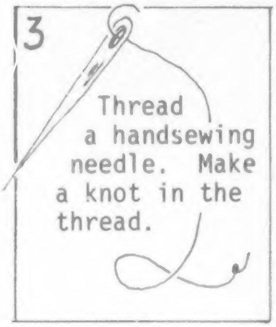
Fold a piece of cloth and pin it with straight pins.

2



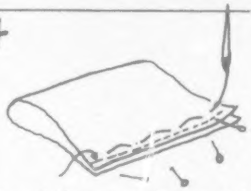
Use the tracing wheel, tracing paper, and a straight edge to mark a straight line along the edge of the cloth.

3



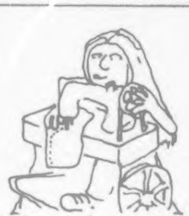
Thread a handsewing needle. Make a knot in the thread.

4



Hand baste (sew with long stitches) the cloth. Take out the straight pins.

5



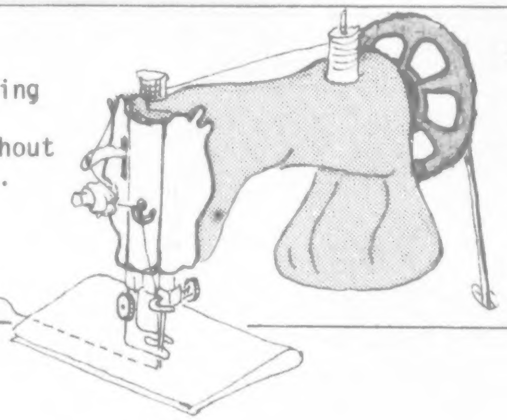
Watch a demonstration of the use of the sewing machine.

6

Practice operating the machine by "sewing" without thread or cloth.

7

Thread the sewing machine.



8

Sew a straight line along the piece of cloth using the line drawn with the tracing wheel as a guide.

Culture

In industrial sewing or the garment industry, often hundreds of people will work in a single shop making one product. They work on sewing just one part of a piece of clothing--the collar on a shirt, for example. This involves following patterns and specific procedures.

11 Sewing Machine

Notes

Preparation

Information. See the Appendix: Sewing for safety procedures and information on using a sewing machine.

Bobbins. Have bobbins already threaded for the students. Later, show them how to wind bobbins on the machine.

Adjustment. Before class, set the tension (appropriate for the material students are sewing). Students should not adjust the tension until they know more about the machine.

Activity

Allow plenty of time for students to practice threading a needle. If students cannot see well enough to thread one, they may need their vision checked.

If students are ready, have them practice sewing backwards as well as forwards. Have them also practice sewing around corners correctly and stitching a circular pattern in the cloth.

Language

Keep It. Have students sit in a circle. Give each person two or three of the same tool. The students ask each other, "What are these?" If a student answers correctly (e.g. "They're needles."), she/he keeps the tools. If not, she/he puts the tools in the middle of the circle. The student who has the most tools wins. Vary this by having students ask and answer Yes-No questions (e.g. "Are these _______?") or questions with "How many?" Students must answer the questions correctly or lose a tool.

Cultural Exploration

Simulation. As a follow-up, set up a simulated assembly line--sewing cloth napkins. Set up eight work stations:

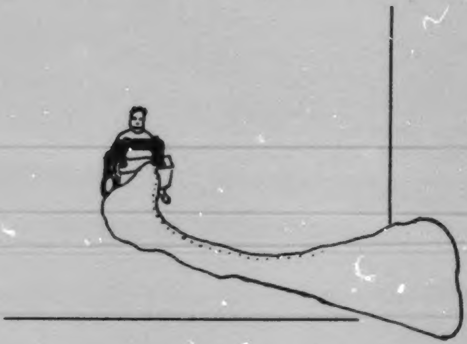
1. Pin the pattern to the cloth.
2. Cut out the cloth.
3. Hand baste the edges.
4. Machine sew the edges.
5. Remove the basting thread and check the quality.
6. Iron the napkins.
7. Check the quality again.
8. Tie the napkins in packages.

Put groups of students at each station. Play the role of supervisor. Discuss the simulation afterwards.

Planning

11 Sewing Machine

Planning



Lesson 12

A Test Light

What can carry electricity? The key to your house? How about a pencil? From the circuit made in Lesson 9, students make a test light and use it to test different objects to see if they can carry electricity.

Purposes

- To make and use a test light.
- To distinguish materials which are insulators or conductors.
- To describe activities in progress.
- To repeat an instruction to clarify understanding.

12 A Test Light

Tools and Materials

Soldering Kit (see Lesson 7)	1 per class
razor knife	1 per class
metal file	1 per class
wire cutter	3 per class
pencil	1 each
eraser	1 each
plastic tape	2 rolls per class
battery holder, with light bulb socket attached (students made in Lesson 9)	1 each
batteries, 1.5 volts (size to fit battery holder)	2 each
light bulb, 2.5 volts (size to fit socket)	1 each
bell wire, red* (15 cm.)	1 each
bell wire, black* (15 cm.)	1 each
insulator/conductor form*	1 each
objects pictured on form*	1 of each per class
objects not pictured on form (e.g. staples, matchbox, eraser)	4 objects per class
extension cord (made in Lesson 4)	1 each
test light*	1 per class

*preparation required before class

Language

Cut the wire. This wire?

What are you doing? I'm cutting the wire.

A

What is he doing? He is cutting the wire.
she She

Is this a conductor? It's a conductor.
Is this an insulator? It's an insulator.

B

wire
light bulb
battery
test light

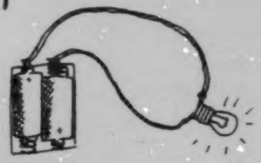
cutting
stripping
tinning
twisting
testing

DANGER
ON
OFF

12 A Test Light

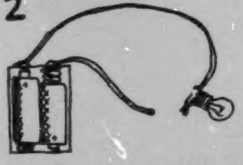
Activity

1



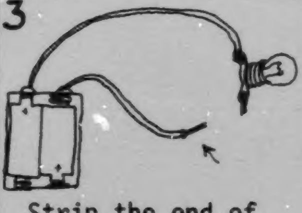
Connect the circuit so the bulb lights up.

2



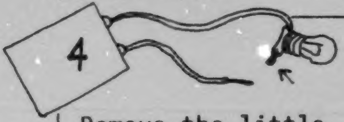
While the bulb is lit, cut the black wire close to the bulb.

3

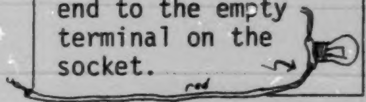


Strip the end of the wire you just cut.

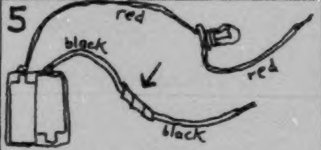
4



Remove the little piece of black wire that is soldered to the socket. Strip a red wire. Solder one end to the empty terminal on the socket.

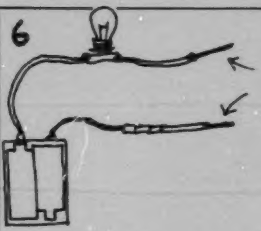


5



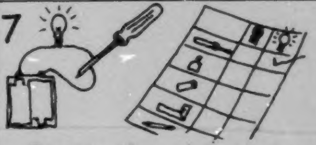
Strip a black wire. Join one end to the black wire attached to the battery holder. Cover the connection with tape.

6



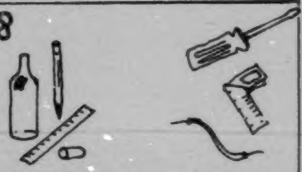
Tin the ends of the wires with a soldering iron.

7



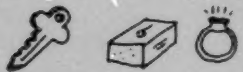
Touch the object to be tested with both wires. Mark the form to show if the test light lights or not.

8



Continue testing other objects on the table. Sort the insulators from the conductors.

9



After the form is completed, take a few more untested objects. Predict if they will light the test light bulb or not.Test them to see.

Culture

As a machine or object is in the process of being made in a factory, it usually goes through many tests. They may be very simple. Does the light in a toy car work correctly? Other times testing involves the use of complicated equipment such as checking out the circuitry in an electronic caluclator. At home when an appliance breaks down one cannot always tell immediately what is wrong. Often simple testing can determine whether it can be fixed or not. Becoming familiar with different kinds of test equipment can be useful for home repairs as well as at work.

12 A Test Light

Notes

Activity

It might be helpful to explain in simple terms the basic idea of a circuit (in the students' native language). For example, something you cannot see comes out one end of the batteries, goes through one wire, the bulb, another wire and into the other end of the battery. It does not come out, unless it can follow a path that lets it go back in again. When a circuit is "on," electricity can flow through it. When it is "off," nothing flows in the circuit.

Have students test their personal belongings (earrings, belt buckles, buttons, etc.) to see if they light the test light.

The test light should light when the two ends of the wires touch. If not, check for loose connections or a broken bulb.

Language

Action Sequence. Give students instructions (e.g. "Strip the wire."). Stop them in the middle of the process and ask, "What are you doing?" Have them answer in complete sentences (e.g. "I'm stripping the wire."). Vary this by having students work in small groups to give instructions, to stop each other to ask and answer questions.

Tell Me What. Have students mime actions. The others guess by saying what a person is doing (e.g. "You're cutting."). Vary this by making it a contest between teams, using cards with pictures of actions as cues for students.

Cubes. Put pictures of various actions on six sides of a cardboard cube. Students throw the cube and look at the picture facing up. One student asks the question (e.g. "What are you doing?") and another gives the appropriate answer (e.g. I'm testing). Vary this by asking Yes-No questions.

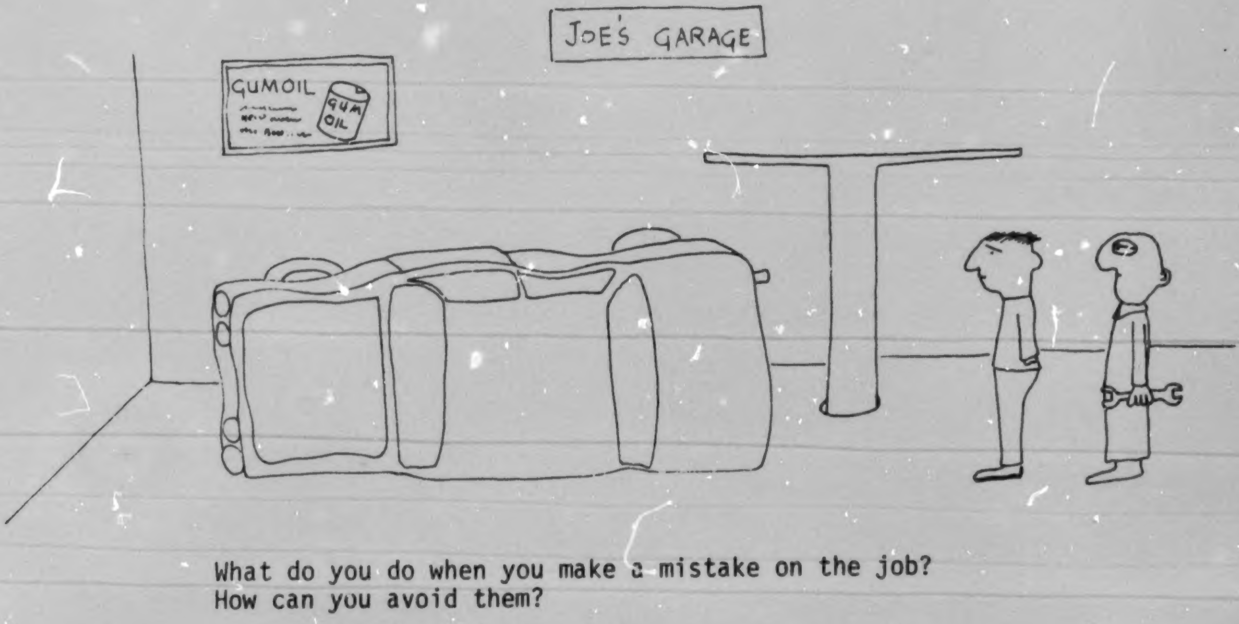
Open-Ended Task. Do an end-of-the-unit assessment of students' overall progress. One way is to bring in an assortment of tools and materials used in previous lessons and ask students to show how to use them. Ask them to explain the names of items, to describe what they are doing, and to use feedback language. Use the assessment to plan the language for Unit 2.

12 A Test Light

Planning

12 A Test Light

Planning


JOE'S GARAGE
GUMOIL
GUM OIL

What do you do when you make a mistake on the job?
How can you avoid them?

Unit 2

Structures

A LEVEL | B LEVEL

GIVING AND CLARIFYING INSTRUCTIONS

A LEVEL		B LEVEL
Saw + the board. Verb object	The board? object	You should saw the board. verb object
Don't saw it now? time		You shouldn't saw the board. verb object
Saw it later. time		

QUESTIONS WITH "to be"

A LEVEL		B LEVEL	
Is this my wood? your	It's my wood. your	Whose board is it?	It's my board. his her
Are these the same or different?	They are the same. They are different.		Its mine. his hers yours

QUESTIONS WITH "to do"

A LEVEL		B LEVEL	
Do you have a board? need	Yes, I do No, I don't.	Does he have a board? she	Yes, he does. No, he doesn't.
		Do we have a board? they	Yes, we do. No, we don't.
		Do you need any boards?	Yes, I need some. No, I don't need any.

QUESTIONS WITH "can" AND "would"

A LEVEL		B LEVEL	
Can you saw the board?	Yes, I can. No, I can't.	Can he saw the board? she	Yes, he can. No, he can't.
Would you saw the board, please.	Yes. No.	Who can saw the board?	He can. She can.

QUESTIONS ABOUT ACTIONS

A LEVEL		B LEVEL	
Are you sawing the board?	Yes, I am. No, I'm not.	What is he doing? she	He's sawing. She's
What are you doing?	I'm sawing.		

OTHER QUESTION WORDS

A LEVEL		B LEVEL	
What do you have?	I have a box.	What does he have? she	He has a board. She
How many do you have?	I have one.	What kind of board do you want?	I want a___ board.
How much do you have?	One cup.		
Who has a box?	I have.		

VERBS

have
want
need
work
help
use
read
fill in
strip
twist
tin
solder
test
check
drill
saw
hold
put on
oil
sand
tape
pin
thread

Everyday English

Add related language for each category.

FINDING OUT

How's it going?
OK.
Not so good.

What's wrong?
Look. (I have a problem.)

Do you have a problem?
Yes,
No, (Everything's OK.)

Is this right?
Yes, (It's all right.)
No, (It's not right.)

Can you help me?
Yes, (I can.)
No, (I can't now.)

What's next?
Now (do this.)

GOING FURTHER

A. Hue, this is my supervisor. Mr. Jones
name my friend. Mrs.
Ms.

Mr. Jones, this is Hue.
name

B. Glad to meet you.

GETTING THINGS DONE

Help me!
Look out!
Hurry up.
Slow down.
I'm sorry.
Excuse me.

SOCIALIZING

Good morning.
afternoon.

How do you feel?
I feel great.
I feel tired.
I feel hungry.
I feel sleepy.

How old are you?
I am _______.

Where do you live?
I live at ______.

See you at ____ o'clock.

See you tomorrow.
Monday-Friday.

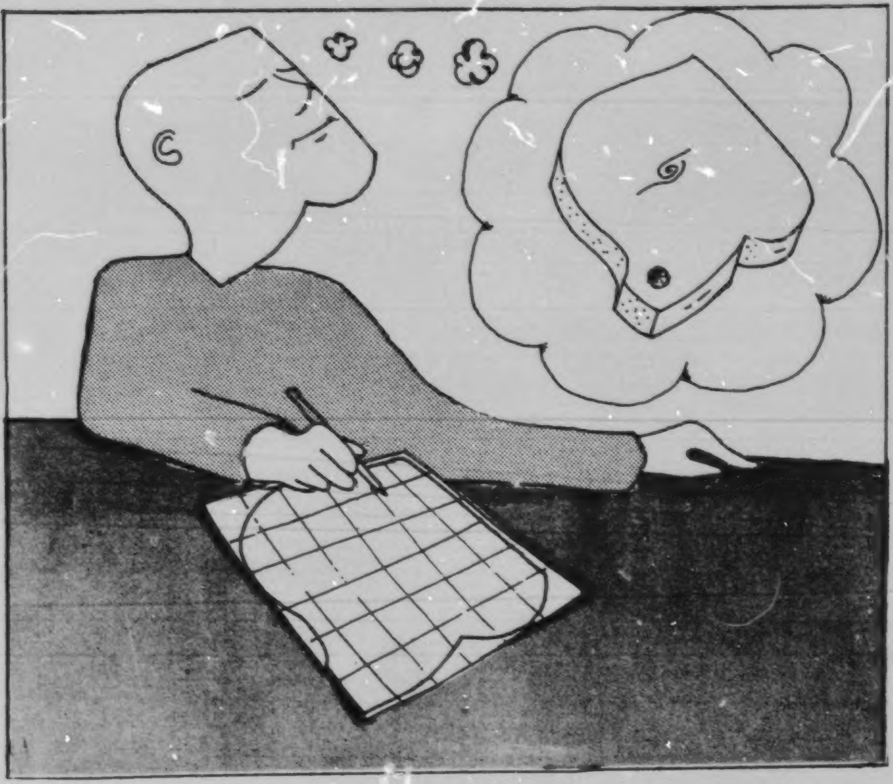
Have a good weekend!

Planning Page

Lesson 13

Planning a Cutting Board

Students try out different patterns for a cutting board on small grid paper. Then they enlarge their favorite pattern onto grid paper the same size as the wood, and trace it onto the wood. In the next two lessons they will make their own cutting board.



Purposes

- To apply pattern-making skills.
- To design a pattern for a cutting board.
- To enlarge a design.
- To ask and answer questions about tools and materials that one has.
- To say who a tool belongs to.

13 Planning a Cutting Board

Tools and Materials

hand saw	1 per pair
square	3 per class
pencil sharpener	1 per class
food knife	1 per class
compass	1 per pair
straight edge	1 per pair
pencil	1 each
eraser	1 each
carbon paper	1 per pair
grid paper* (1½ cm. squares, with 4 grid)	1 each
large grid paper, sized to match board* (3 cm. squares)	1 each
board* (2x18.5 cm. x 28 cm. per student)	
sample cutting board*	2-3 per class
sample designs on grid paper with 4 boxes*	1 per class
sample design on large grid paper*	1 per class

* preparation required before class.

Language

Do you have a pattern? Yes, I do.
No, I don't.

What do you have? I have a pattern.

A

Whose pattern is this? It is my pattern.
his
her
your

B

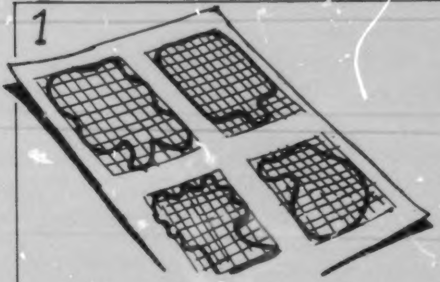
pattern
saw
cutting board
pencil
paper
eraser

draw
copy
saw
use

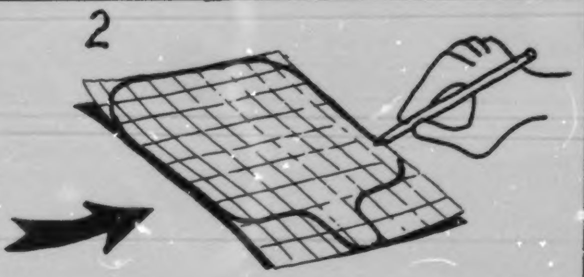
DANGER

13 Planning a Cutting Board

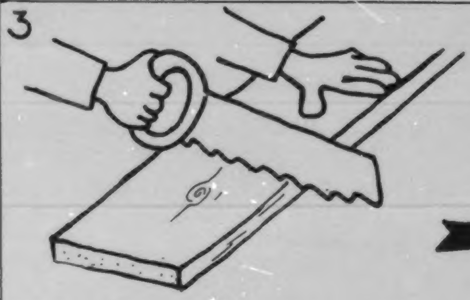
Activity



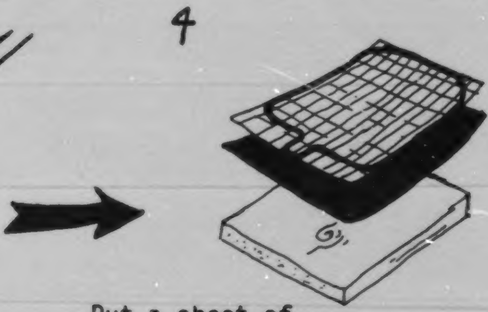
Draw some patterns
for a cutting board
on the small grid paper.



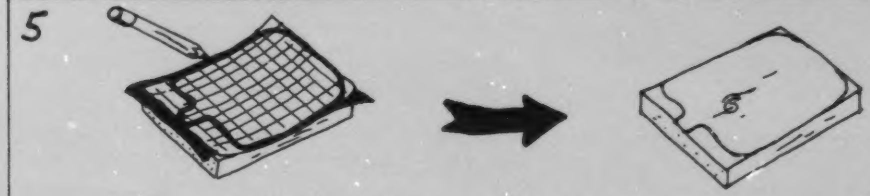
Copy your favorite pattern
onto the large grid paper.



Saw off a board
the same size as
the large grid paper.



Put a sheet of
carbon paper between
the pattern and the board.



Trace the pattern onto the board.

Culture

Precision and attention to detail are important aspects of the American work place. This is especially true where the same product is made many times and every product needs to look the same. A difference of a fraction of an inch can be crucial.

The use of grid paper is an example of an effective means to maintain precision and detail when enlarging a drawing or a pattern.

13 Planning a Cutting Board

Notes

Preparation

Wood. The grid paper you use needs to match the size of the board. Buy 1 x 8 boards, since this is the same width as the large 6 square x 9 square grid paper (see Appendix: Handouts). Select wood without knots or that looks like it won't crack. If necessary use #1 (top grade) pine.

Sample Product. Bring in a few finished cutting boards to show students different design possibilities.

Activity

Demonstrate the use of the cutting boards by cutting a loaf of bread or a piece of fruit on the sample board.

Show the students the grid papers you used to enlarge the design for one of the cutting boards.

Give the students time to try different design possibilities before asking them to choose one to enlarge.

Be sure that students follow appropriate safety procedures in using the saw (see Appendix: Woodworking).

Have the students write their names lightly in pencil on their boards (they can sand them off later) to locate them for the next class.

Language

Question-Answer Practice. Distribute an assortment of tools, materials and other objects to students. Students ask each other in succession, "What do you have?" and give the appropriate response (e.g. "I have a book."). Vary this by having students ask Yes-No questions. As a follow-up, put students into small groups to ask each other questions about what objects they have.

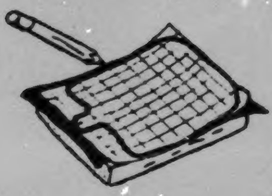
Spinner. Tape 6 small pictures of tools on a Spinner Card, so that you can remove them easily. Before one student spins the arrow, another looks at the pictures and asks about one (e.g. "Do you have a saw?"). The first student spins, and gives the answer the arrow points to (e.g. "No, I don't. I have a pencil."). She/he then removes the picture from the card. When all the cards are removed, the students ask each other questions about which ones they have.

13 Planning a Cutting Board

Planning

13 Planning a Cutting Board

Planning



Lesson 14

Sawing a Cutting Board

Students use a saber saw to cut out their patterns for cutting boards. Then, they use a rasp to smooth the edges to prepare the boards for sanding. Students learn safety procedures and expressions and gain greater confidence in using an electric tool.

Purposes

- To give and respond to safety warnings.
- To demonstrate maintenance procedures for a saber saw.
- To report about activities in progress.
- To follow instructions to delay, repeat or reorder an activity.

14 Sawing a Cutting Board

Tools and Materials

saber saw	1 per pair
replacement blades (general wood cutting)	dozen per class
screwdriver (for tightening or changing blades)	1 per class
lubricating oil	1 can per class
"C" clamp (6" or 8" size)	1 per pair
safety glasses	1 per pair
rasp (3-4 different varieties)	1 each
extension cord (students made in lesson 4)	1 each
cutting boards (begun in lesson 13)	each person's own
scrap blocks of wood (for clamping)	1 per pair

Language

What are you doing? I'm plugging in the saw.

Don't plug in the saber saw now.
Do it later.

Not like that, like this! OK.
Watch out! Sure.
Sorry.

A

What is he doing? He is plugging in the saw.
she She

You should plug in the saber saw.
shouldn't

B

saber saw
extension
glasses

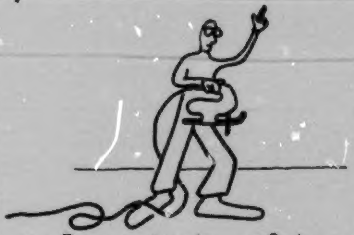
plug in
put on glasses
turn on
turn off
hold
unplug

ON
OFF

14 Sawing a Cutting Board

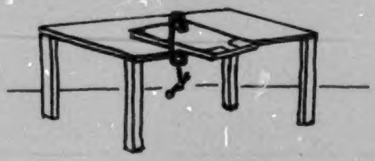
Activity

1



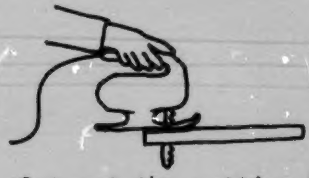
Demonstrate safety rules for using a saber saw.

2



Fasten the board to the table with a C clamp.

3

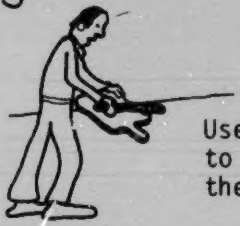


Cut out the cutting board.

4

Turn off the saw
when it jams,
when the blade
wiggles loose,
when the blade breaks,
when you move the board,
and when you finish.

5



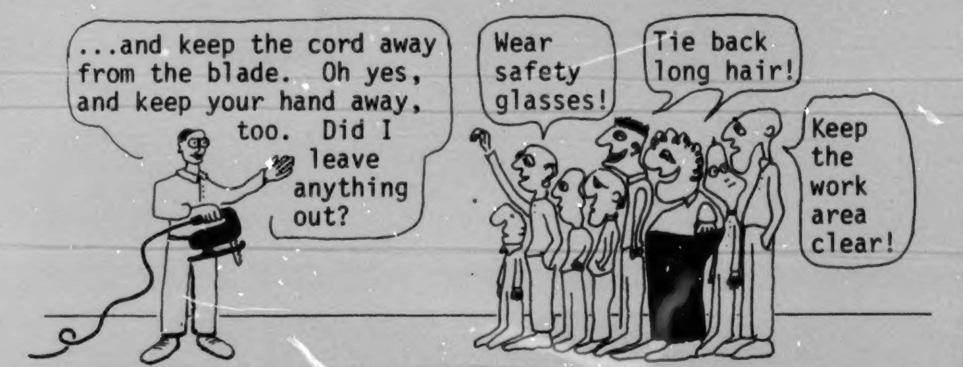
Use a rasp to smooth the rough edges.

6

Maintenance Procedures:

a. Remove and replace the blade.
b. Oil the saber saw.
c. Coil the saber saw cord.
d. Store the saber saw in its box.

Safety



...and keep the cord away from the blade. Oh yes, and keep your hand away, too. Did I leave anything out?
Wear safety glasses!
Tie back long hair!
Keep the work area clear!

14 Sawing a Cutting Board

Notes

Preparation

Saws. If you cannot afford so many saber saws, use just one and have students work on this activity over a longer period of time. Or, use hand-operated saws, such as a coping saw (see Appendix: Woodworking).

Sanding Blocks. In the next lesson, students will need 2 x 6 x 9 cm. blocks of wood for sanding blocks. Students who finish this activity quickly can make them

Activity

If the saber saw is a variable speed model, demonstrate how to control the speed. Adjust the speed according to the kind of wood and to the kind of cut (straight or curved).

If students are not familiar with a saber saw, allow them to turn it on and off a few times to get used to the switch and the vibration.

Demonstrate the proper use of the rasp (see Appendix: Woodworking).

Language

Action Sequence. Give instructions to the students to use the saber saw safely. Use warnings (e.g. "Like this. Not like that.") as you demonstrate the procedures. Have a student follow your instructions.

1. Put on the glasses.
2. Plug in the saw.
3. Hold the saw.
4. Turn on the saw.
5. Use the saw.
6. Turn off the saw.
7. Unplug the saw.

As a follow-up, have students give the instructions and warnings to each other. Vary this by asking, "What are you doing?"

Scrambles. On cards, put pictures of the steps in using a saber saw. Students must put the pictures in the proper sequence. As a follow-up, have students describe the pictures.

14 Sawing a Cutting Board

Planning

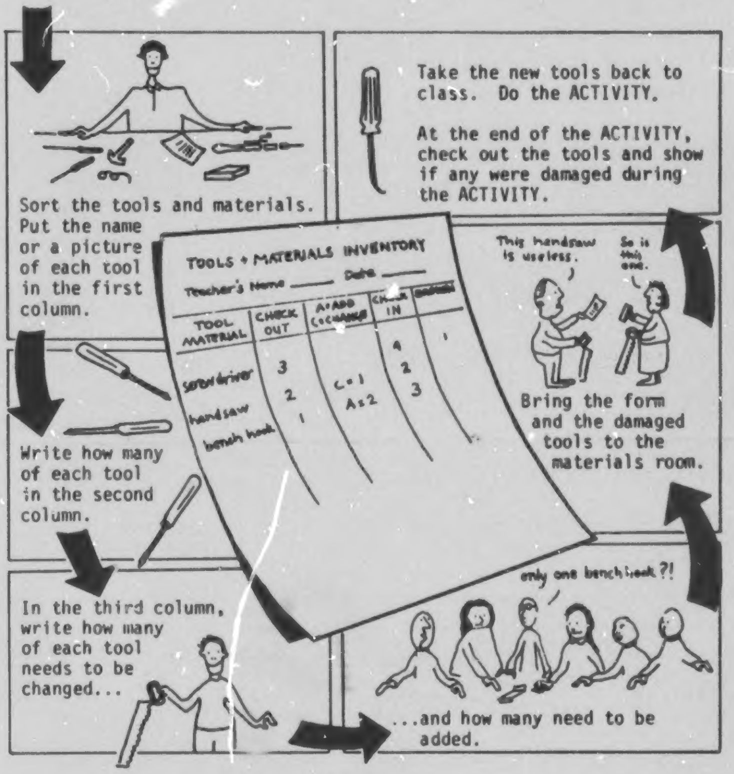
14 Sawing a Cutting Board

Planning

Lesson 15

Taking Inventory

Throughout the course, the students should take an active role in keeping track of tools and materials used in class, and take responsibility for calling attention to defective tools. In this lesson, the students finish their cutting board, and are shown a routine for taking inventory and checking tools for damage.



Sort the tools and materials. Put the name or a picture of each tool in the first column.
Write how many of each tool in the second column.
In the third column, write how many of each tool needs to be changed...
...and how many need to be added.
only one benchhook ?!
TOOLS + MATERIALS INVENTORY
Teacher's Name ______ Date ______
TOOL MATERIAL
CHECK OUT
A=ADD C=CHANGE
CHECK IN
screwdriver
handsaw
bench hook
3
2
1
C=1
A=2
4
2
3
1
This handsaw is useless.
So is this one.
Bring the form and the damaged tools to the materials room.
Take the new tools back to class. Do the ACTIVITY.
At the end of the ACTIVITY, check out the tools and show if any were damaged during the ACTIVITY.

Purposes

- To organize, count and sort tools and materials used in class.
- To use a simple inventory and requisition form.
- To check tools for damage and report needs.
- To ask for replacement tools.
- To provide and verify a count using numbers.
- To finish a woodworking project.

15 Taking Inventory

Tools and Materials

hand drill	2 per class
drill bit (¼" diameter)	1 per class
counter sink bit	1 per class
"C" clamp	1 per pair
straight edge	4 per class
rasp (3-4 varieties)	1 per pair
orbital/oscillating sander (optional)	1 per class
extension cord (optional)	1 per class
electric drill (optional)	1 per class
sandpaper	
coarse	1 per pair
medium	1 per pair
fine	1 per pair
sanding block* (approx. 2 x 6cm. x 5cm.)	1 each
scrap blocks of wood (for clamping)	1 per pair
cutting boards	each person's own
string or leather lace (optional)	3 meters per class
vegetable oil	1 container
cloth	1 per pair
Tools and Materials Inventory form (see Appendix: Handouts)	1 per pair

*preparation required before class

Language

X: What do you need?
Y: I need saws.
X: How many do you need?
Y: I need two.
X: Here you are.
Y: Thank you.

A

saw
drill
drill bit
sandpaper
wood
rasp

1-10

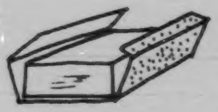
X: What's wrong with the saws?
Y: They're broken.
rusty.
dirty.

X: Do you need any sandpaper?
Y: Yes, I need some. No, I don't need any.

B

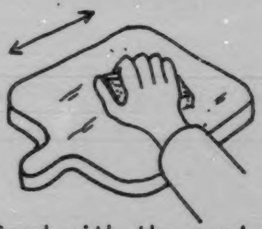
Activity

1



Wrap a piece
of sandpaper
around a block of wood.

2



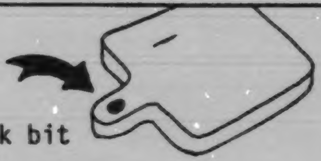
Sand with the grain.

3

Use
different
sanding
techniques.
(see Appendix.)

4

Use the drill,
a bit,
and a countersink bit
to make a hole
for hanging the board.



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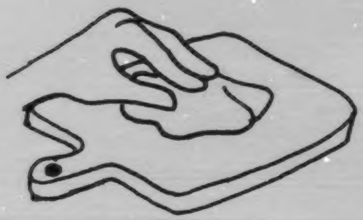
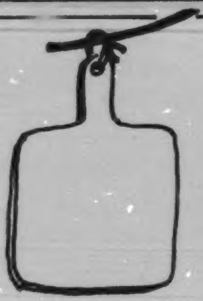


Apply oil to the board
with a cloth.

6



Hang the board to dry.

Culture

The demand for products to be nicely finished is common in the U.S. Sandpaper is used for most work that requires smoothing a surface, as in making wood products, in furniture refinishing, and in maintenance work. Sandpaper is also used for roughing smooth surfaces to prepare them for painting, as in house painting and auto body work.

In all cases, attention to fine detail are likely to be appreciated by employers and consumers.

15 Taking Inventory

Notes

Preparation

Tools To Inventory. Bring in additional tools, especially damaged or rusty ones, to supplement those on the materials list. Soldering irons, drills, saws and razor knives are good choices.

Supply Room. The illustration shows the steps for taking inventory. If you don't have access to a supply room, simulate one in the classroom.

Sanding. Prepare the sanding blocks before class. For information on sanding, see Appendix: Woodworking.

Activity

This lesson shows how taking inventory and using an inventory form can be integrated into other lessons as part of the classroom routine. One goal is to have students take responsibility for keeping track of their equipment.

At the end of class, count and record the number of tools "checked in" in column 4. If any tools were broken during the activity, record this in column 5. (For the Inventory Form, see Appendix: Handouts.)

To cut sandpaper, fold it, place a straight edge along the fold and tear the paper. Don't use scissors, they soon get dull.

Oil the finished cutting boards with cooking oil, since it is not harmful to the human digestive system. Apply it thinly, a little at a time.

Language

Situation. To present the meaning of "to need," mime various tasks (e.g. cutting paper with your fingers, drilling without a drill bit, sanding with white paper). Ask students, "What do I need?" Elicit the response, "You need ________." As a follow-up, have students mime tasks.

Cultural Exploration

Simulation. Set up a supply room, with students in the role of workers. Play the role of the supply clerk. Students submit their Inventory Forms and the tools. Have students practice the language they will need for the exchange. Vary this by having students play the role of the clerk.

Planning

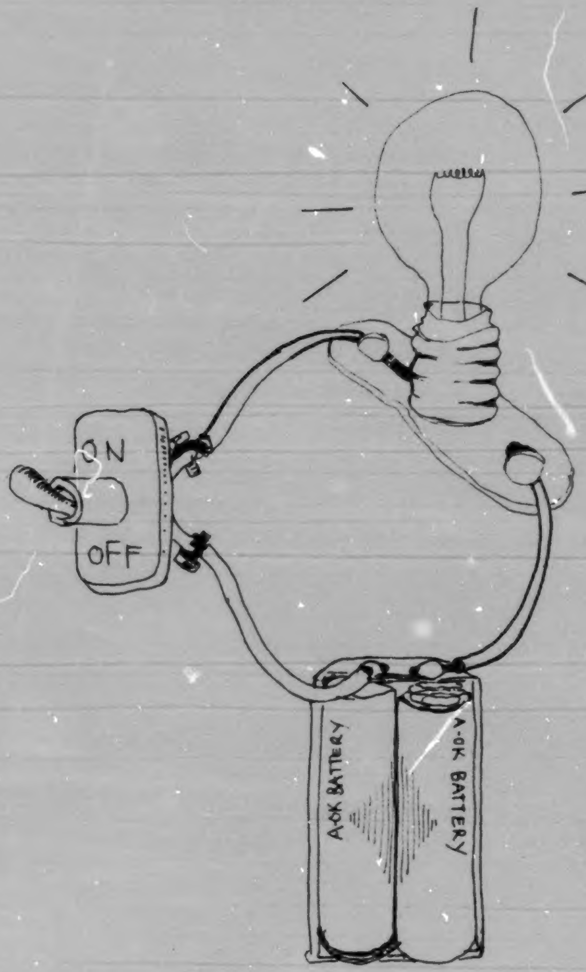
15 Taking Inventory

Planning

Lesson 16

Circuit and a Switch

In this lesson students make a circuit using batteries, a bulb, wire and a switch. They draw a diagram of the circuit they have made.



Purposes

- To install a switch in a bulb and battery circuit.
- To make a diagram of a circuit.
- To ask and answer questions with "whose."
- To read ON and OFF.

16 Circuit and a Switch

Tools and Materials

screwdriver	1 each
long nose pliers	3 per class
pencil	1 each
eraser	1 each
plain paper	1 each
switch	1 each
other kinds of switches (e.g. "double pole-double throw" switch with 6 terminals)	1 per 3 students
wire* (with stripped ends, 15-30 cm.)	10 per class
test light (students made in lesson 12)	1 each

* preparation required before class.

Language

Is this your switch? Yes, it's my switch.
my No, it's your switch.

Whose switch is this? It's my switch.
your

A

Whose switch is this? It's mine.
his.
hers.
yours.

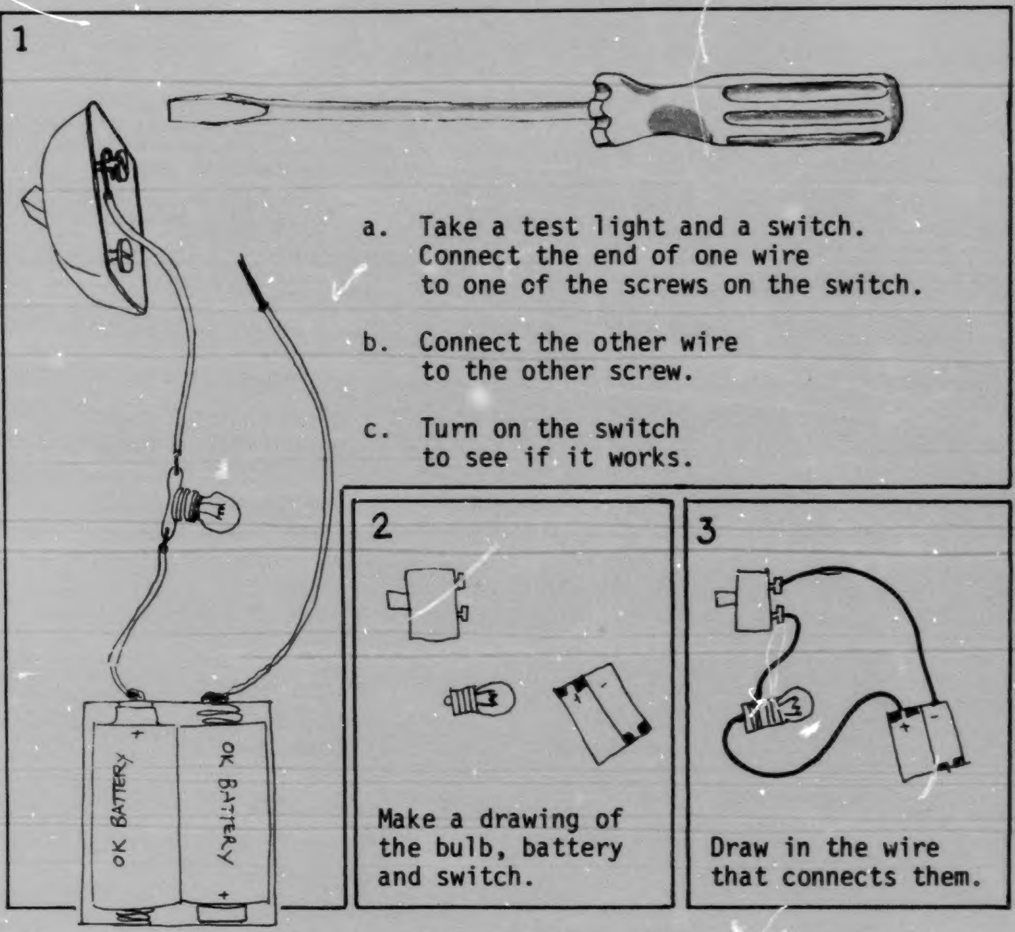
B

switch
test light
paper

connect
turn on
turn off
draw

ON
OFF

Activity



1

a. Take a test light and a switch. Connect the end of one wire to one of the screws on the switch.

b. Connect the other wire to the other screw.

c. Turn on the switch to see if it works.

2

Make a drawing of the bulb, battery and switch.

3

Draw in the wire that connects them.

Culture

One refugee employer commented that having one American friend on the job who can serve as an advocate and assist a refugee to clear up misunderstandings with co-workers was a key factor in whether or not many refugees were able to successfully hold a job.

What are some ways your students will be able to get to know fellow workers on the job?

16 Circuit and a Switch

Notes

Activity

Try an open-ended approach with this activity. Simply distribute the parts to the circuit, and ask students to make the circuit work.

For students who finish early, have them attach several test lights to a switch that has more than two terminals (e.g. a "double pole-double throw" switch) so that some lights go on when the handle is moved in each direction. This shows students more about switches.

Language

Whose Is It? After students have drawn their circuits, divide the class into two groups. Students in one group exchange their drawings with the other group. The first group asks the second questions to identify the owners of the drawings (e.g. "Is this your paper?" or "Whose paper is this?"). Students answer in complete sentences. The second group then asks the first group questions. As a follow-up, students write the owner's names on the papers.

Cultural Exploration

Role Play. Divide the class into two groups. Ask one group to imagine they are at a new job. Ask the others to play the roles of American workers who have been on the job for a long time. Both groups are in the workers' lounge; it is coffee break time. Students role play coffee break conversation in pairs. Discuss and practice possible exchanges beforehand.

16 Circuit and a Switch

Planning

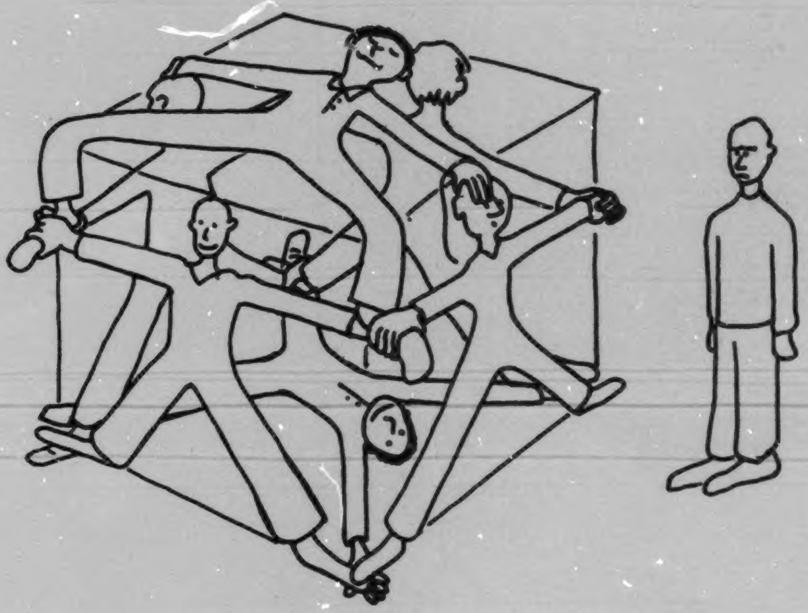
16 Circuit and a Switch

Planning

Lesson 17

Patterns for Cubes

Students find different flat patterns for cubes. They draw these patterns, cut them out and fold them to make cubes.



Purposes

- To independently solve a construction problem by visualizing solutions.
- To develop judgement about the volume of cubic solids.
- To name the parts of a cube.
- To say whether two objects are the same or different.
- To describe the number of objects.
- To ask what one should do using sequence words ("first, next, then").

17 Patterns for Cubes

Tools and Materials

straight edge	1 each
scissors	3 per class
pencil sharpener	1 per class
pencil	1 each
eraser	1 each
masking tape	1 roll per class
grid paper* (3 cm. squares)	3 sheets each
assembled cubes* (small)	2 per class
(large)	1 per class

*preparation required before class.

Language

How many cubes do you have? I have one.

Are they the same? Yes, they are the same.
different? No, they are different.

A

cube
side
corner
square

1-10

What should you do first? First, unfold the cube.
next?
then?

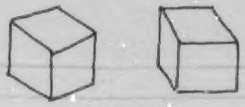
B

unfold
cut
copy
fold
tape

17 Patterns for Cubes

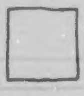
Activity

1



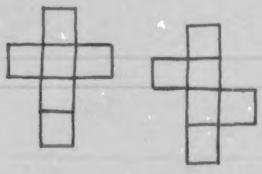
Look at the two paper cubes. They are the same size. Each has 6 sides.

2



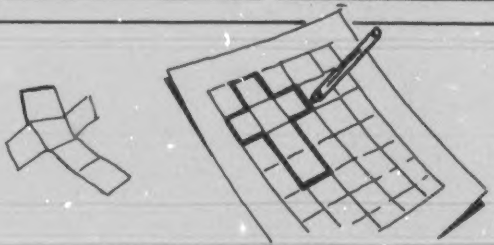
Each side of a cube is square. Each side is equal in size.

3



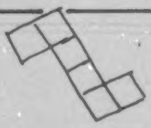
Unfold the cubes to see their different patterns.

4



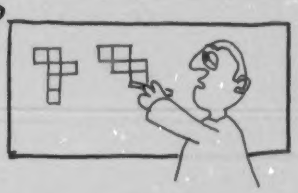
Copy one of the patterns on grid paper; cut it out and fold it into a cube.

5



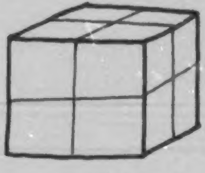
Use more grid paper to draw other patterns that you think will make a cube. Cut them out and fold them.

6



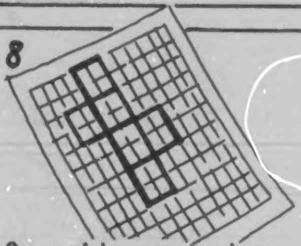
Draw any new patterns you discover on the blackboard.

7



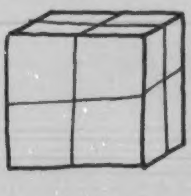
Now, look at this bigger cube. Do not unfold it.

8



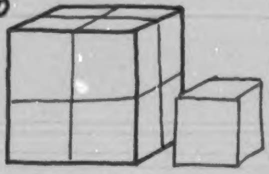
On grid paper, draw a pattern that will make the bigger cube.

9



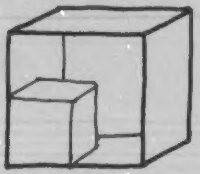
Cut out and fold the pattern to make the bigger cube.

10



How many small cubes will fit into the bigger cube?

11



Fill the big cube with the small cubes.

17 Patterns for Cubes

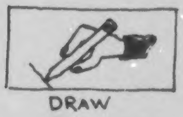
Notes

Activity

This lesson provides interesting opportunities for students to find their own ways to complete the task or to learn from watching each other. It also provides opportunities for you to observe your students' learning styles.

Language

Picture Cues. Prepare a set of pictures illustrating the steps of the activity. Students give the instructions for each step and then put the pictures in the correct order. Ask questions about the pictures. Then, have students describe the sequence using "first, next, then."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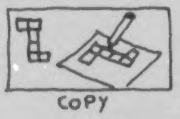
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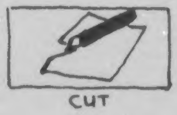
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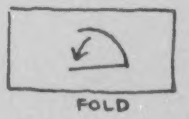

FOLD

Clarification. Have students practice asking for clarification of instructions. To cue students, draw lines on the blackboard to show the change of intonation that occurs when a statement becomes a question.

Unfold the box.   Unfold the box?

Vary this by presenting other ways to clarify instructions (e.g. "What?" or "Which one?").

Question-Answer Practice. Put an assortment of drawings of geometrical shapes (circles, squares, triangles, etc.) on the blackboard. Make some of them identical. Ask the question, "Are they the same or different?" Then point to two shapes. Students give the appropriate answer (e.g. "They're different."). Students ask the question while you cue responses.

Reflection

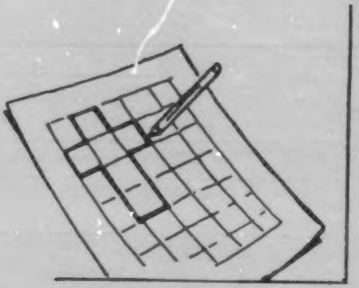
Questions. Ask the students to think about the lesson and answer these questions (through an interpreter aide, if necessary):

- What problems did you meet in completing the task?
- What similarities are there between solving the problem to make a cube and deciding how to repair something in the home?
- How many ways did you find to complete the task?

Planning

17 Patterns for Cubes

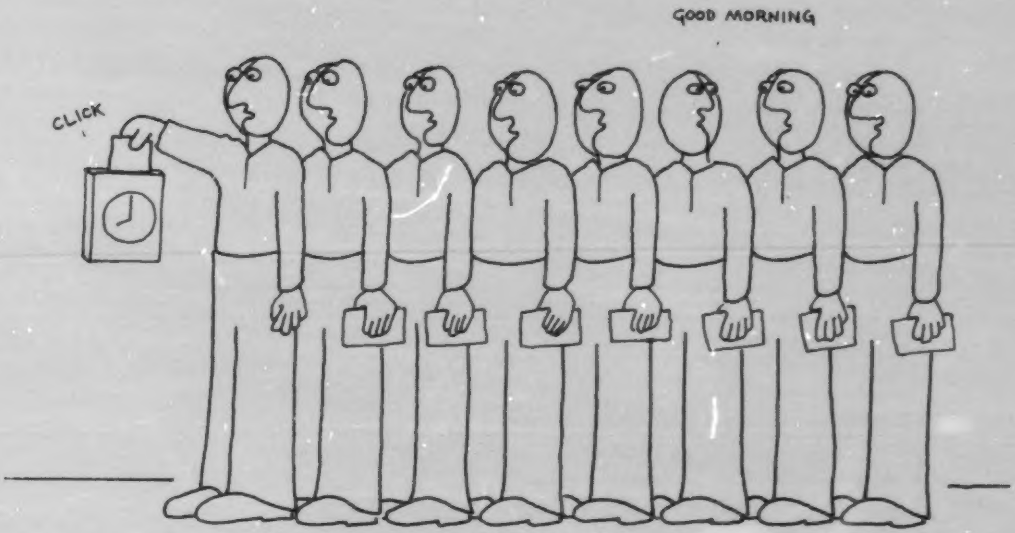
Planning



Lesson 18

Using Time Sheets

At their jobs, most Americans have to sign in and out on a time card. Other jobs require estimating or recording exactly how long it takes to do certain tasks. In this lesson students get practice reading a clock and recording the time it takes to perform tasks. They set up a system for signing in and out on a time card, a routine which is practiced daily throughout the rest of the lessons.



Purposes

- To read a clock.
- To write the time one begins and finishes a task.
- To establish a daily routine of filling out a time sheet.
- To ask and answer questions about time.
- To read NAME, IN, and OUT

18 Using Time Sheets

Tools and Materials

clock (with second hand, not digital)	1 per class
cassette player	1 per class
cassette tape of music	1 per class
coping saw	1 per class
hack saw	1 per class
back saw (optional)	1 per class
hand saw, 10 or 12 point	1 per class
saber saw (optional)	1 per class
wood (see Notes)	
time card*	1 each
timing a task form*	2 each
tools and materials for other activities that can be timed (see Notes)	

*preparation required before class.

Language

What time is it? It's one o'clock.
one-fifteen.
one-thirty.
one-forty-seven.

How many minutes? 5 minutes.

A

What time did you start? At one o'clock.
finish?

Were you early? I was early.
late.? late.
on time? on time.

B

clock
time
time sheet

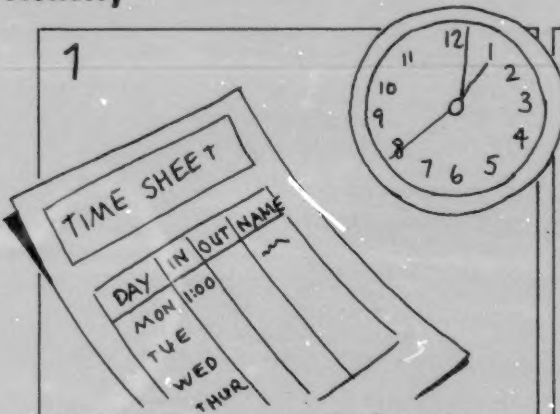
read
write down
fill in

1-60

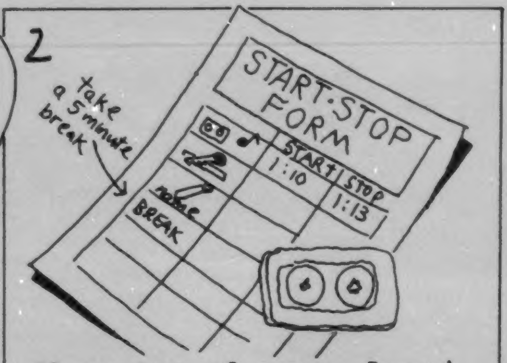
one o'clock
1:00-12:59

NAME
IN
OUT

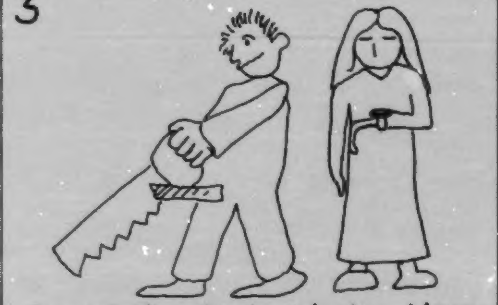
Activity


1
TIME SHEET
DAY
IN
OUT
NAME
MON
1:00
TUE
WED
THUR

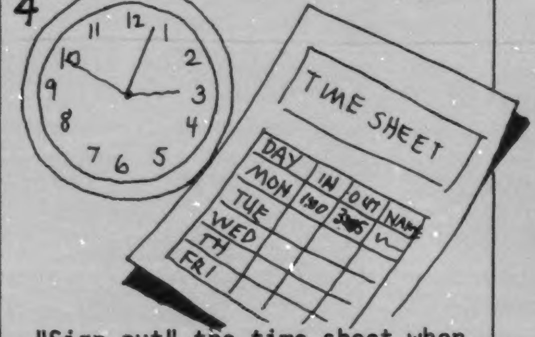
Write your name and time you arrive in class on the time sheet.


2
take a 5 minute break
START-STOP FORM
START
STOP
1:10
1:13
BREAK

Play a tape of a song. Record the start and stop time on the activity form. Use a watch with a minute and second hand.



Record the start and stop times for the other tasks listed on the form.


4
TIME SHEET
DAY
IN
OUT
NAME
MON
1:00
3:05
TUE
WED
TH
FRI

"Sign out" the time sheet when you finish class.

Culture

Perceptions and attitudes about time and work differ from country to country. In some cultures time is not as rigidly scheduled as it is in the United States. In the American workplace breaks, lunch hours and vacations are arranged to make the most efficient use of time and meet the demands of production.

On the job workers usually fill out a time sheet when they arrive at work and before they leave. Punctuality is one of the most important elements of a good work record.

What was the working routine of your students in their home countries?

18 Using Time Sheets

Notes

Activity

Establish a routine where students fill in a time sheet before and after class. Find a place near the door to put the time cards so students can sign in and sign out independently.

Once this routine is in place, advanced students can practice other time-related language, such as reporting why they were late or early.

To practice timing tasks and filling out the form, choose a variety of brief activities (sawing a board with various saws or smoking a cigarette).

Language

Getting Ready. You may have to choose how many steps of the activity to cover, depending on your students' background. If they have never used a clock before, do some of these preparatory activities:

- Cardboard Clock. Present whole hours from 1:00 to 12:00 using a clock with moveable hands. Teach the question "What time is it?" and the response "It's _____ o'clock."
- Numbers. Review the numbers from 1-59 as you move the minute hand on the clock. (e.g. "It's one-oh-one."). Write the times on the blackboard (e.g. 1:01).
- Dictation. Give the students cardboard clocks. Write a time on the blackboard and have them move the hands to that time. Vary this by saying a time and having students write it on paper or on the blackboard.
- Spinner. Make a spinner card that illustrates a clock face with numbers. Put another arrow on the board for the hands of the clock. Each student spins the hands and reads the time.

Cultural Exploration

Proverb. Present the proverb "Time is money." Ask students to state implications of this proverb. Point out the importance of punctuality on the job, scheduled times for lunch and coffee breaks and the need to report to your supervisor if you need more time to complete a task. Ask them to make comparisons with their native countries.

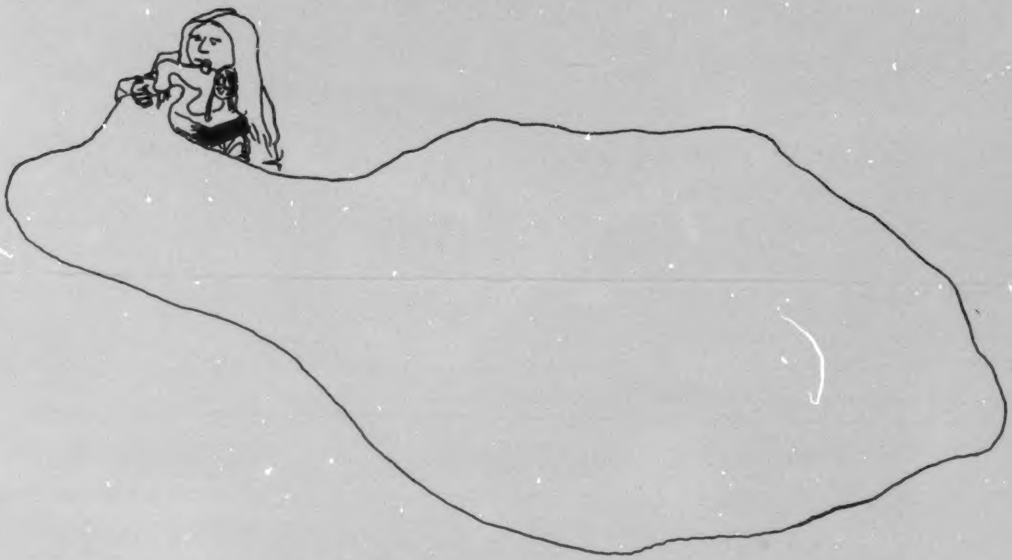
Planning

18 Using Time Sheets

Planning

Lesson 19
Sewing a Bag

Students use a pattern and a sewing machine to make a small cloth bag.



Purposes

- To use a pattern and a sewing machine to prepare and sew together a small bag.
- To ask and answer questions with "can."
- To tell who is able to do the job.
- To give reasons why one can or cannot do the job.

19 Sewing a bag

Tools and Materials

sewing machine	1 per pair	plain paper	1 each
machine sewing needles	4 per machine	newsprint	2 sheets/class
bobbins	4 per machine	tracing paper	1 package/pair
ruler	1 per pair	cloth	1½-2m./class
tracing wheel	1 per pair	thread, spool	2 per machine
scissors	1 per pair	snaps, sew/on type	2 per person
hand sewing needles	1 each	sample small bag*	1 per class
pins	1 package/pair	sample pattern for small bag*	3 per class
pencil	1 each		
eraser	1 each		

*preparation required before class.

Language

Can you sew?	Yes, I can. No, I can't.
Why not?	I don't have a needle.

A

Can he sew?	Yes, he can. she
	No, he can't. she
	He doesn't have a needle. She
Who can sew?	I can sew. He She

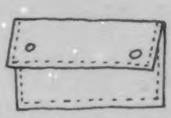
B

a needle
a pin
thread
cloth
scissors

sew
thread the needle
pin
fold the cloth
cut
make a knot

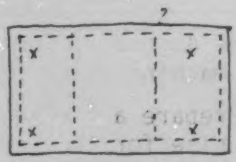
Activity

1



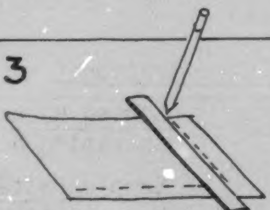
Look at the model of the small bag you are about to sew.

2



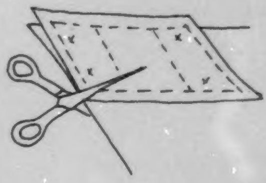
Look at the pattern that was used to make the bag.

3



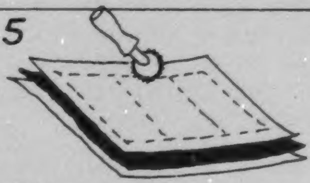
Copy the pattern onto a piece of paper. Use a pencil and straight edge.

4



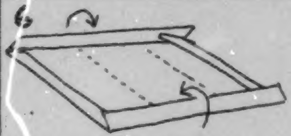
Pin the pattern to a piece of cloth. Cut out the cloth.

5



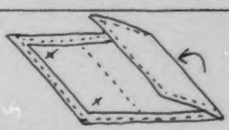
Place tracing paper between the pattern and the cloth. Pin them together. Use a tracing wheel to trace the pattern.

6



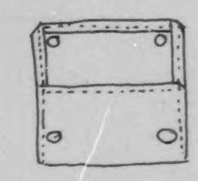
Take out the pins. Fold the edges of the cloth and pin them. Use the sewing machine to sew the four folded edges.

7



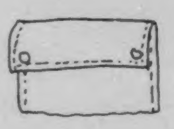
Fold the cloth so that a bag with a flap will be produced. USE THE SEWING MACHINE to sew the bag.

8



Using a needle and thread, sew on the snaps by hand.

9



Finished.

Culture

Many of your students may be experts in sewing and embroidery. Some may have used a sewing machine. Their skills and knowledge may help them get jobs sewing in the United States. Others may be able to make clothes for their family or operate a small business out of their homes.

19 Sewing a bag

Notes

Preparation

Sewing Machine. See Appendix: Sewing for information about operating a sewing machine.

Sample Patterns. Prepare a few sample patterns for the cloth bag. A convenient size for the pattern is "8½" x "11". Draw a margin around all four sides of the paper, "½" from the edge. Draw two lines where the bag will be folded. Put an X to show location of each of the four snaps.

Activity

It is possible to make a simple cloth bag without a pattern. However, the steps in this activity give students experience in using patterns and sewing tools which are important for more complex sewing projects.

If there are students who already know how to sew, have them teach the others how to do it.

If students finish early, they can sew decorative patterns on their bags.

You can follow this lesson with other sewing activities or projects. Some possibilities: mending or altering students' clothes, making shoulder bags, children's toys, carpenter's aprons, cloth holders for tools, napkins, tablecloths or aprons.

Language

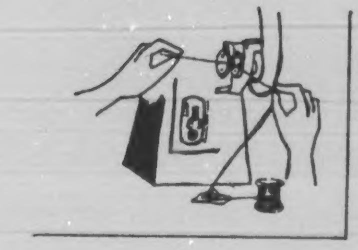
Can You? Give each student one or two materials, but not enough to hand sew a small cloth. Ask questions about what students are able to do (e.g. "Can you pin the cloth?"). Students answer (e.g. "No, I can't.") and give a reason (e.g. "I don't have pins.").

Requests. Present the structure "Can you ______?" as an option for making requests (e.g. turning on the lights, cleaning up, assisting one another). Have students practice these requests.

Planning

19 Sewing a bag

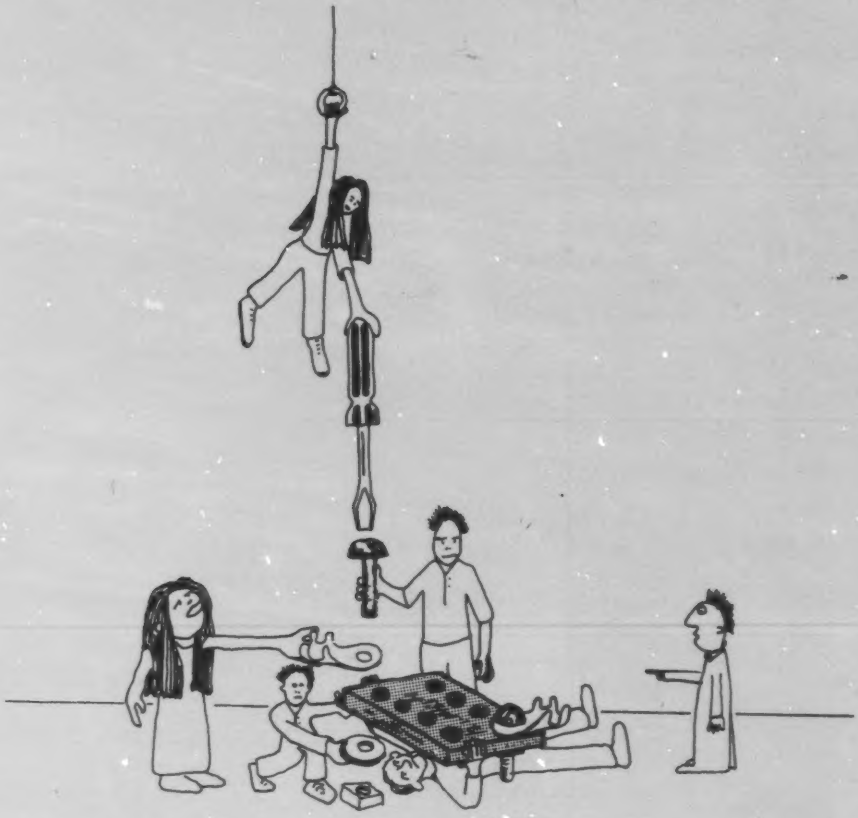
Planning



Lesson 20

Making a Terminal Board

Students measure a small piece of masonite, cut it to size, and drill holes in it. In each hole, a nut and a screw are used to attach a terminal. In later lessons students will solder a wire to each terminal, and use the terminal board in electrical circuits.



Purposes

- To make a terminal board according to specifications.
- To give and follow instructions.
- To ask for items in the workplace using the construction "Would you ______?"
- To indicate what things one wants.

151

20 Making a Terminal Board

Tools and Materials

Soldering Kit (see lesson 7)	1 per class
hand drill	1 per pair
drill bit set	1 per pair
razor knife	1 per pair
saw (backsaw, hacksaw, or coping saw)	4 per class
square	4 per class
screwdriver	3 per class
wire cutter	3 per class
ruler	3 per class
pencil	1 each
eraser	1 each
rubber band	1 each
masonite (about 15 x 15 cm.)*	4 per class
screw and nut (small, length between 1.5 cm. and 2.5 cm.)	8 each
washer (size to fit screw)	8 each
terminal (1 hole type)	8 each
wire (lamp cord, 40 cm. x number of students)	1 per class
sample terminal board*	3 per class
extension cord (students made in lesson 4)	1 each
bench hook (or other table protection)	4 per class

* preparation required before class.

Language

Would you give me the saw please?

Here you are.
Sure.
What?
The saw?

Thank you.

A

saw
wire cutters
nut
screw
terminal
wire

What do you want? I'd like the saw.

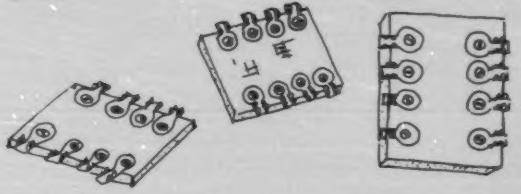
B

give
hand
pass
get

20 Making a Terminal Board

Activity

1

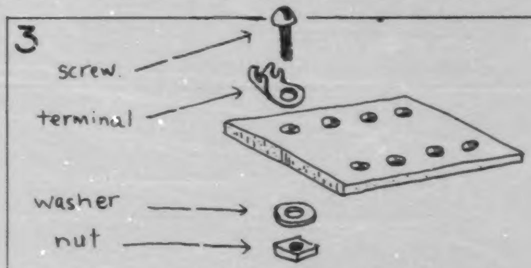


Look at the samples of the terminal board you are going to make.

2

Use a saw to cut a piece of masonite the size you have decided to make (not smaller than 5 x 7 cm and not larger than 6 x 10 cm).

3

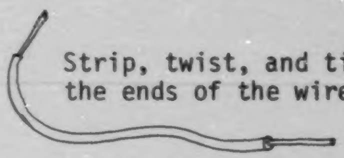


Drill 8 equally spaced holes and attach each terminal with a nut, a screw, and a washer.

4

Measure and cut 8 wires 10 cm long each.

5



Strip, twist, and tin the ends of the wires.

6

Write your name on the terminal board. Wrap it and the wires together with a rubber band.

Culture

A significant number of Southeast Asian refugees that resettle in certain areas of the United States find entry level jobs in electronics assembly--where working to specification is required.

20 Making a Terminal Board

Notes

Preparation

Wire. Each student will need 80 cm. of wire. Separate a 40 cm. piece of lampcord into single, insulated wires. If the terminals are very small, bell wire may be more suitable, because it is thinner than lampcord (see Appendix: Electricity).

Samples. Encourage students to decide their own size of terminal board (as long as it is within the limits specified). If the students are not able to measure with a ruler, provide samples of three sizes: small (5x7 cm.), medium (5.5x9 cm.) and large (6x10 cm.).

Activity

Encourage students to find their own ways to locate where they will drill the eight holes. Some may prefer to do it by eye. Others may use a ruler.

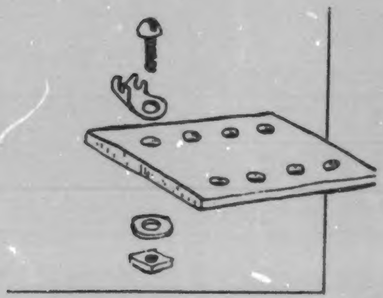
Language

Role Play. Present the request, "Would you _______, please?" and the response, "Thank you." Ask students to imagine themselves at a job and to approach you (an American co-worker) to request something. Vary the role play by expressing misunderstanding or asking for clarification (e.g. "The saw?" "What?") to give students additional practice. Require students to repeat or rephrase the question until you understand.

Planning

20 Making a Terminal Board

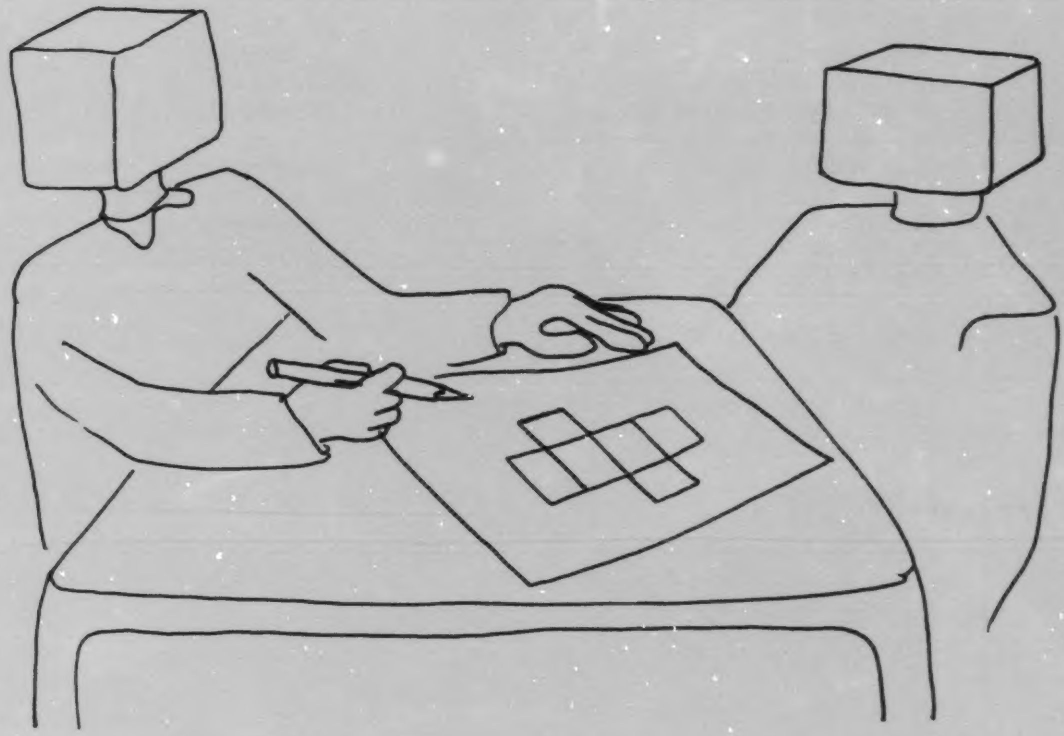
Planning



Lesson 21

Designing Boxes

Students draw flat patterns to make boxes of different shapes. They add flaps to the patterns and glue the boxes together.



Purposes

- To solve a construction problem by visualizing solutions.
- To copy something carefully and with precision.
- To ask or tell who has or needs an object.

21 Designing Boxes

Tools and Materials

straight edge	1 each
scissors	1 each
razor knife	3 per class
pencil sharpener	1 per class
pencil	1 each
eraser	1 each
paper clip	12 per class
carbon paper	3 sheets per class
glue (in container)	1 per class
glue applicators (wooden popsicle sticks)	4 per class
poster paper	3 sheets per class
grid paper* (3 cm. squares)	2 sheets each
rectangular box* (2 shapes)	2 per class
box with flaps*	1 per class
protection for table	1 per pair

*preparation required before class.

Language

Who has a box?	I have a box. You
	He has a box. She

A

Do we have a box? they	Yes, we do. they
	No, we don't. they

B

a box
a straight edge
a pattern
scissors
glue
paper

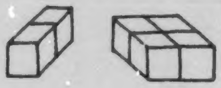
have/has
need/needs

unfold
look at
draw
copy
cut
glue

21 Designing Boxes

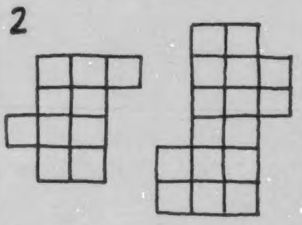
Activity

1



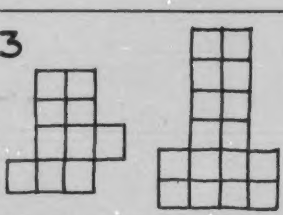
Look at the two paper rectangular boxes.

2



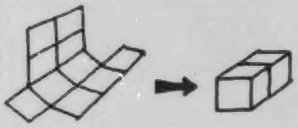
Unfold each one to look at the pattern.

3



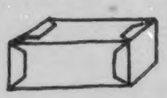
On grid paper, draw another pattern that will make one of the boxes.

4



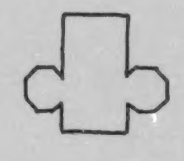
Cut out your pattern, and fold it up to make a rectangular box.

5



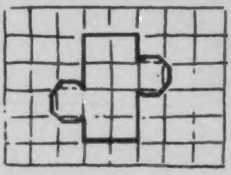
Look at a paper box made with flaps.

6



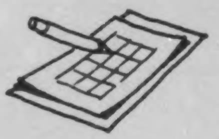
Unfold the box and look at the pattern.

7



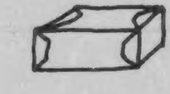
Draw your pattern on another piece of grid paper, and add flaps to it. Cut it out and try it.

8



Copy your pattern onto poster paper with carbon paper.

9

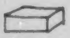


Cut out your pattern on the poster paper, fold, and glue down the flaps.

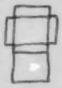
Culture

People who apply to some job skills training programs have to answer test questions on spatial visualization. Here is an example:

Which pattern makes this box?



A



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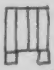

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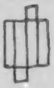

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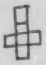


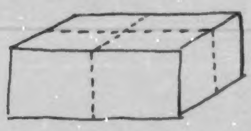
21 Designing Boxes

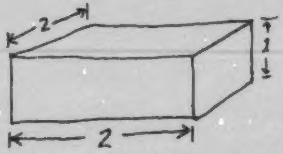
Notes

Activity

Here are some variations in presenting this activity:

- Don't unfold the sample boxes.
- Don't show sample boxes to the students. Instead, draw perspective diagrams on the blackboard. For example:


(for A level students)



(for B level students)

If students cut out the boxes with a razor knife and a straight edge, use a steel straight edge, not plastic or wood ones. Or, use scissors instead. Be sure to protect the table if you use razor knives.

To fold the poster paper, put the straight edge along the line marking the fold and gently bend the paper up and over the straight edge.

Language

Tell Me What. Present the instructions for the steps of the activity by miming the actions. Students say the instructions.

Who Has What. Put an assortment of tools, materials and objects in a large box. One by one, students take an item from the box, hide it and return to their seats. Students then say what they think the others have (e.g. "Lee has a pencil."). Students confirm or deny (e.g. "Yes, I do," or "No, she doesn't."). Vary this by having students ask, "Who has a __________?"

Planning

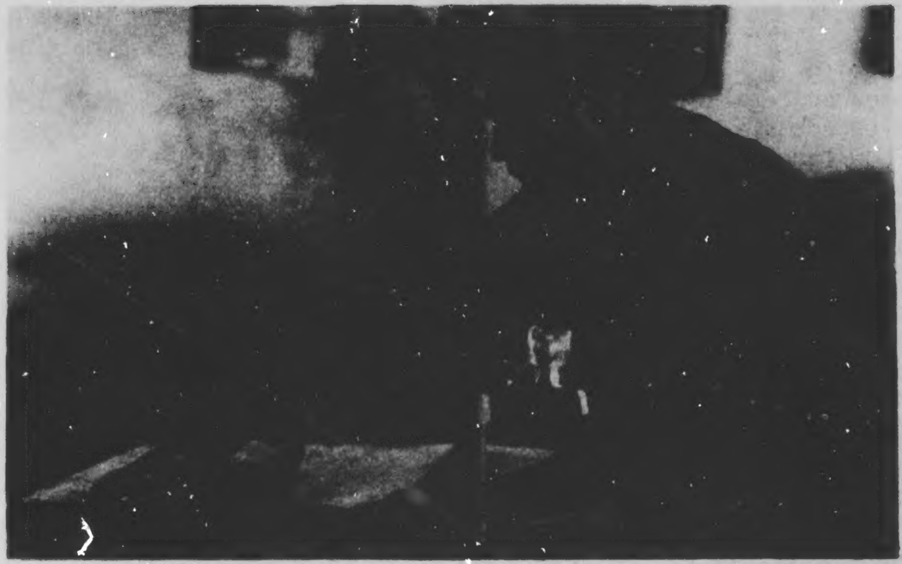
21 Designing Boxes

Planning

Lesson 22

Plumbing Diagrams

Students draw, name and sort common plumbing parts. Then, following a diagram, they use the parts to put together a small plumbing system.



Purposes

- To recognize, sort and classify the parts of a plumbing system by name, shape, size and function.
- To assemble a small plumbing system according to specifications on a diagram.
- To ask and answer questions about the size, number and kind of tools needed.
- To read HOT and COLD.

22 Plumbing Diagrams

Tools and Materials

timers/stop watch (optional)	1 per class
pencil	1 each
eraser	1 each
masking tape	1 roll per class
paper squares* (10 x 10 cm.)	1 each
set of 6 diagram cards* (see Appendix)	2 per class
elbow	30 per class
tee	18 per class
coupling	18 per class
threaded female adapter	6 per class
threaded male adapter	6 per class
elbow/threaded female adapter	3 per class
faucet (brass)	6 per class
valve, shut off (brass)	2 per class
P.V.C. pipe *	
long (40 cm.)	10 per class
medium (25 cm.)	15 per class
short (10 cm.)	20 per class
bucket (containers)	11 per class

*preparation required before class

Language

What do you need? I need a/an pipe.

What size do you need? I need a long pipe.

How many do you need? I need two.

A

What kind of part do you need?

I need a brass faucet.

B

pipe
elbow
tee
faucet
adapter

long
medium
short

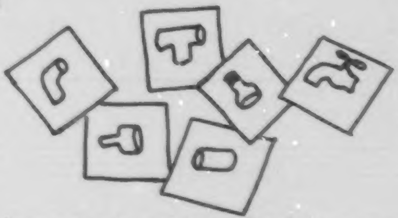
1-10

brass
plastic

HOT
COLD

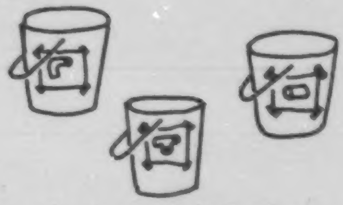
Activity

1



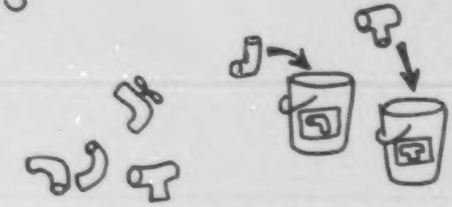
Draw each of 11 plumbing parts on a piece of paper (10 x 10cm)

2



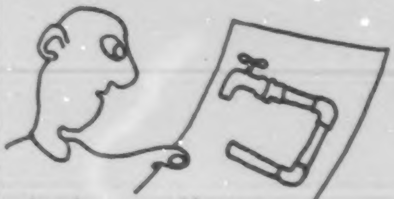
Use these to label eleven containers. Tape them on.

3



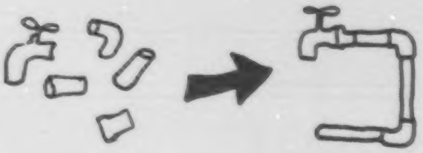
Sort all the parts into the appropriate containers.

4



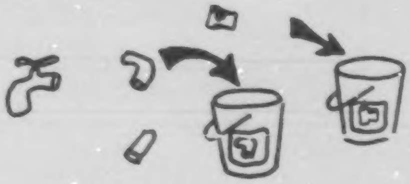
Look at a diagram of a plumbing system.

5



Take the parts you need from the containers to assemble the system in the diagram.

6



Return the parts to the right containers. Follow another diagram to assemble a different system.

Culture

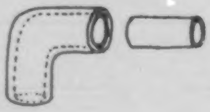
Many things that can be bought in stores require some simple assembly. Some bicycles, shelves, storage sheds, and toys come in kits with instructional diagrams provided to show how to put them together. Some cooking recipes also require reading visual diagrams. In repairing equipment around the house, often diagrams found on the back of appliances can be helpful for troubleshooting.

22 Plumbing Diagrams

Notes

Preparation

Pipe Sizes. Plumbing parts, pipes and fittings (elbow, coupling, reducers, etc.) come in different sizes. Two standard specifications are the inside dimension (I.D.) and the outside dimension (O.D.). This is important when planning a plumbing system to fit together. For example, the O.D. of a pipe must equal the I.D. of the elbow.



When you purchase the materials, take the six diagrams to the hardware store or plumbing supply store so that the clerk can see what needs to fit together.

Coupling. "Couplings" in this lesson are purchased plumbing parts, not the improvised parts in Lesson 1.

Diagrams. Make two copies of each diagram so that you can give pairs of students different diagrams to work on.

Activity

Have students work in pairs on the three flat diagrams first. As groups finish, give them the three-dimensional diagrams.

Toward the end of the activity, have the students do one of the following:

- Time how long it takes to assemble a system. See who can do it the fastest.
- Find a way to connect all the systems together.
- Have students make a drawing of a new system they want to build. They figure out which parts they need and build the system.

Language

Ask For It. After students have selected their diagrams, have them ask for the parts they need. Play the role of a "parts clerk" and give them the parts they ask for. Vary this by deliberately giving students the wrong parts (or not enough) to give them more language practice.

Missing Letters. To review signs, write the words on the blackboard, but leave out letters that students must write in (e.g. DAN-ER, O-F, -N).

Cultural Exploration

Depiction. Have students draw a picture of how water was transported from one place to another in their previous homes. Students interpret their depictions for the rest of the class.

22 Plumbing Diagrams

Planning

22 Plumbing Diagrams

Planning

Lesson 23

Soldering Terminals

Using terminal boards prepared in Lesson 20, students solder a wire to each of the eight terminals. They test each solder connection for strength and appearance, and use a test light to check each connection.

Purposes

- To make effective, consistent solder connections.
- To assess the quality of the product being made.
- To describe activities in progress.
- To compare the strength and quality of the finished products.

23 Soldering Terminals

Tools and Materials

Soldering Kit	1 per class
razor knife	1 per pair
wire cutter	3 per class
long nose pliers	3 per class
screwdriver	3 per class
metal file	1 per class
test light	1 each
extension cord (students made in lesson 4)	1 each
terminal board (from lesson 20)	each student's own
tinned wire (from lesson 20)	8 each
terminal board with some wires attached*	3 per class

*preparation required before class.

Language

Are you soldering? Yes, I am.
No, I'm not.

A

Which one looks good? This one looks good.
better?
the best?

Which one is strong? This one is strong.
stronger?
the strongest?

Which ones work? These work.
These don't work.

B

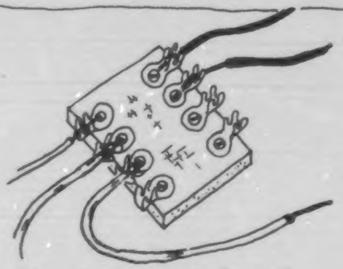
soldering iron
wire
wire cutter
connecting
test light

soldering
cutting
terminal
testing
checking

23 Soldering Terminals

Activity

1



Look at an example of a terminal board with some wires attached.

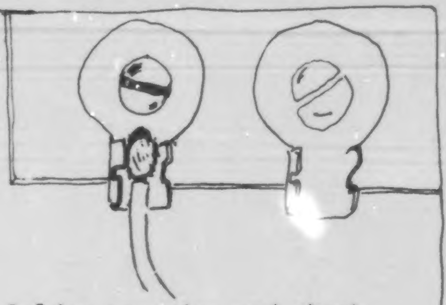
2 Compare the connections to decide which are badly soldered and which are nicely soldered.

a) Compare the connections visually. Decide which are good and bad.

b) Test each connection with a test light.

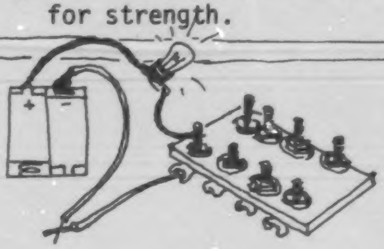
c) Pull each wire to test for strength.

3



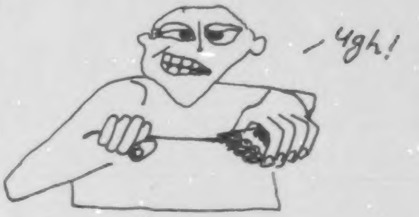
Solder one wire and check how it looks.

4



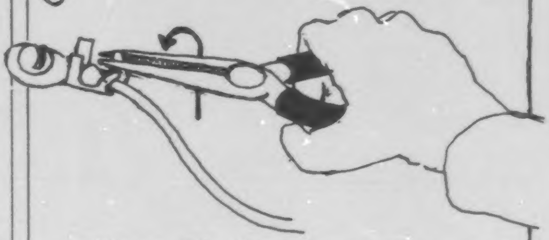
Check for a good electrical connection.

5



Check for strength.
Solder the rest of the wires, checking each one.

6



When all the wires are properly soldered, bend the tabs on the terminal around the insulation on the wire.

Culture

Modern manufacturing depends on accuracy and standardization. Every tool, machine part, cardboard box, or piece of jewelry must be the same as the previous one. Workers are expected to work quickly with a minimum of waste. Inspectors are hired to maintain quality by passing or rejecting finished products. The company's reputation depends on their work.

23 Soldering Terminals

Notes

Preparation

Samples. Solder connections on the sample terminal boards from Lesson 20. On each board, solder some good connections, but also make obvious errors for students to analyze. Don't fold the tabs, because it makes it hard to see the soldered connection. (See Appendix : Electricity.)

Activity

Be sure the terminal is hot enough to melt the solder. Both need to be hot to solder a good connection.

An option is to remove the terminals from the board to solder them.

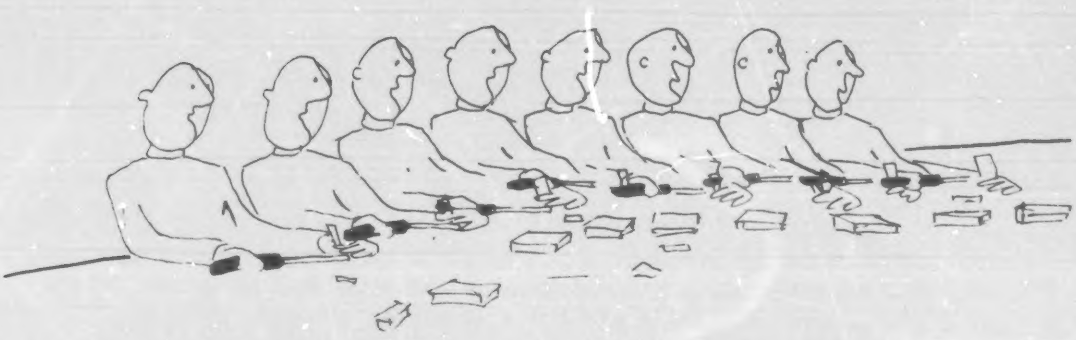
Language

Beauty Contest. After all the terminals are soldered, put all the boards on the table and label each with a number. Divide the students into groups of three--"judging committees." Students examine the boards and confer in their groups (e.g. "Which one looks good?") and award three prizes (good, better and best). The committees present their results.

Follow-Up

Connect the terminals on the sample boards with short pieces of wire. Connect the terminals differently on each board (e.g. connect three terminals together; connect two together; connect another two together; leave one unconnected). Cover the connections and label the wires. Students use a test light to see which wires are connected. Students then follow a similar procedure for their terminal boards.

ASSEMBLING
MANY IDENTICAL
PIECES



Planning

23 Soldering Terminals

Planning

Lesson 24

Making a Lamp

In this lesson students design and make a lamp with plastic PVC pipe as a base. They measure and cut the pipe, make a diagram of their plan, install wire, and attach plugs, sockets, and light bulbs. Students test the lamps and compare them based on strength, size, and quality.

Purposes

- To practice using a tape measure.
- To design and construct a lamp base using pipe, tees and elbows.
- To draw a diagram of the lamp base they have constructed
- To disassemble and wire together the components necessary to make a lamp.
- To use a test light to check for possible short circuits.
- To express comparisons of size, length, strength and quality of a product.
- To describe an activity in progress.

24 Making a Lamp

Tools and Materials

razor knife	1 each
small screwdriver	1 each
hand drill	2 per class
drill bit, ⅜ diameter	2 per class
hack saw	3 per class
tape measure, metric	3 per class
test light	3 per class
extension cord (lesson 4)	1 per pair
pencil	1 each
plastic tape	3 rolls per class
plain paper	1 sheet each
PVC pipe* (1 inch diameter pieces in various lengths)	100-130 cm./pair
elbow	5 per pair
tee	3 per pair
coupling	3 per pair
lamp cord*	1.5 meters per pair
light bulb socket (without switch)	1 per pair
threaded pipe for socket (3/8" x 3)	1 per pair
plug	1 per pair
in-cord switch	1 per pair
light bulb (40 watt)	1 per pair
bench hook or other table protection	1 per pair
sample lamp*	3 per class

*preparation required before class

Language

Which lamp is long? This one.
longer? That one.
longest?

What are you doing? I am measuring.

A

Which lamps are good? These are good.
better?
the best?

B

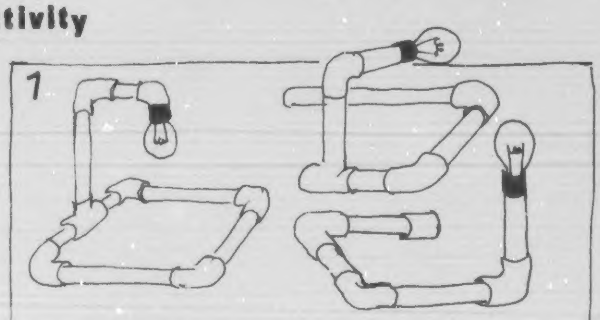
lamp
pipe
extension
lamp cord

long
tall
strong
pretty

measuring
putting together
taking apart
connecting

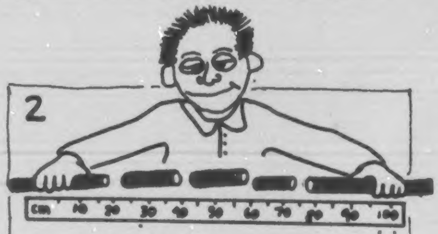
Activity

1



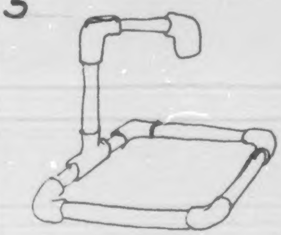
Look at the sample lamps.

2



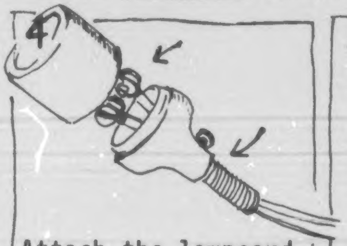
Decide what your lamp will look like and choose pieces of PVC pipe that add up to about 100 cm in length.

3



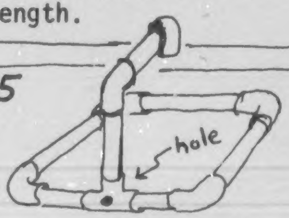
Assemble the lamp.

4



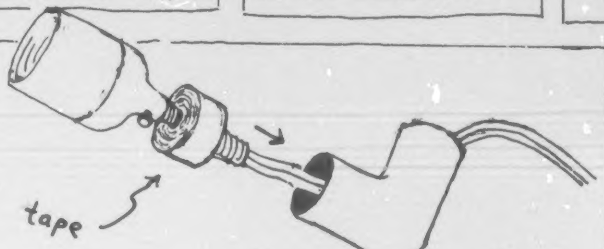
Attach the lampcord and the threaded pipe to the socket.

5



Drill a hole in the base where the wire will come out.
Then, take apart the lamp.

6



Wrap tape around the threaded pipe until it can fit snugly into the mouth of the PVC pipe. Put the cord through the lamp and reassemble it.

7

Attach the switch and the plug to the lampcord.

Use a test light to test for a short circuit.

Culture

Most refugees begin by taking entry-level jobs that require doing routine and repetitive tasks. Training is done on the job. It's important for refugees to be able to describe their skills and the kind of work they like to do best, so an employer can decide if a particular job is right for them. In this manner a refugee can begin work in a field where it may be possible later to move up to a more skilled job.

Can your students describe the skills they have learned in this program and the tools they enjoy using the most?

24 Making a Lamp

Notes

Preparation

Plugs. Use plugs that require students to strip wire and attach it to terminal screws, not the snap-on variety.

Switches. Include in-cord switches in this activity, if they are available. It is easier to see how the circuit and the switches work than if the switch is part of the light bulb socket.

Pipe. Give students several short lengths of pipe rather than one long piece. They can cut these as they wish.

Activity

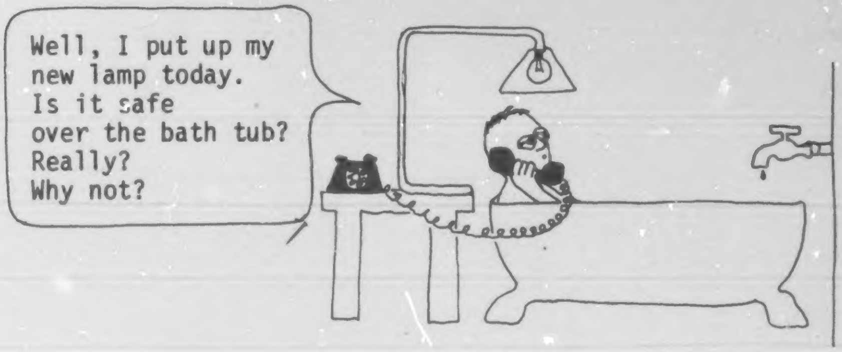
Show sample lamps to students. Some may choose to sketch possible designs.

Have students work in pairs to make their lamps.

As a follow-up, add a switch to a test light to make a simple "lamp." Discuss the similarities between this "lamp" and the ones students have made.

Language

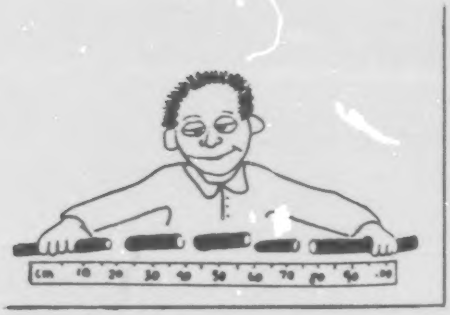
Interview. Assess your students' progress at the end of Unit 2. Set up a mock interview with yourself as the interviewer. Ask students (one at a time) to describe skills they have learned in the program, name tools they have used, follow simple instructions and make small talk. Record the results on a checklist for use in planning future classes.


Well, I put up my new lamp today. Is it safe over the bath tub? Really? Why not?

Planning

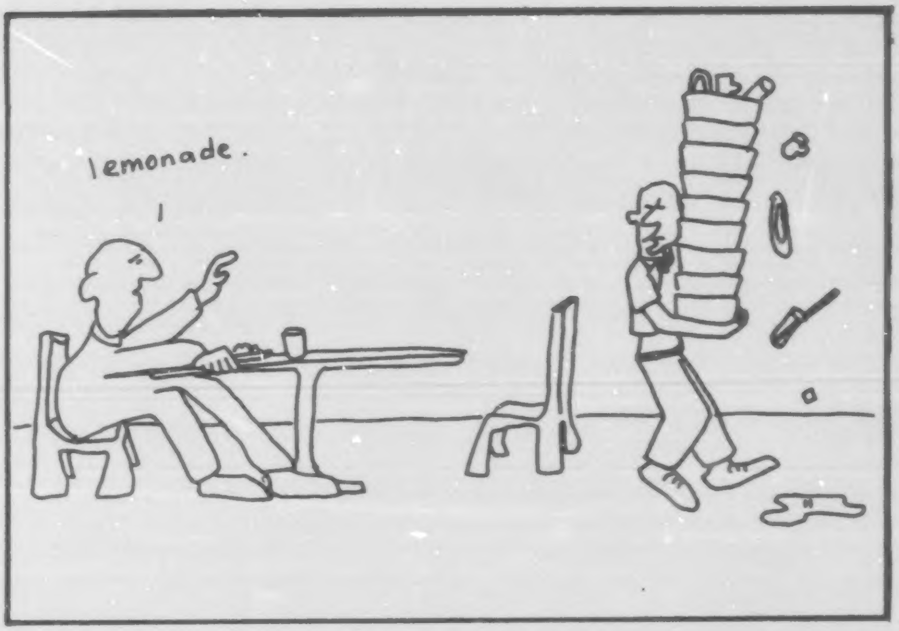
24 Making a Lamp

Planning


cm 10 20 30 40 50 60 70 80 90 100

A Restaurant Simulation

Many refugees find entry-level employment in restaurants, fast food chains or company cafeterias. This simulation provides students with three days of "on the job training." On the fourth day customers are invited and each student performs the role of cashier, cook, waitress, waiter, or dishwasher. The simulation is a model for others which can be designed to recreate various work situations.



Purposes

-To follow instructions to learn a job.

-To respond to customers and co-workers in English.

-To use order checks and cash receipt forms.

-To observe work procedures outlined on a job contract.

-To discuss employer/employee relationships.

A Restaurant Simulation

Tools and Materials

Decide which tools and materials to use. Here are some suggestions:

The Kitchen Area

- coffee pot
- measuring cup
- cups
- saucers
- glasses
- plates
- knives
- forks
- spoons
- dishpans
- dishwashing soap
- towels
- sponge
- large trays

Food

- coffee
- tea bags
- cream
- sugar
- juice
- water
- ice
- snack*

The Restaurant

- cash box
- simulation "cash"
- calculator
- cash receipt forms
- food ordering checks
- menus
- pencils
- tablecloths
- napkins
- "No Smoking" signs

Employee Equipment

- aprons
- caps
- job contracts
- time cards

* doughnuts, cakes, or sandwiches

Language

I'm a ________.	What's your job?
dishwasher	Wash the plate. Rinse the plate. Dry the plate. Put away the plate.
waiter/ waitress	Set the table Take the order. Fill in the check. Serve the food.
cook	Read the check. Make the food. Call the waiter/waitress.
cashier	Take the check Add the total. Give change. Fill in the receipt form. Count the money.

plate
cup
glass
knife
fork
spoon

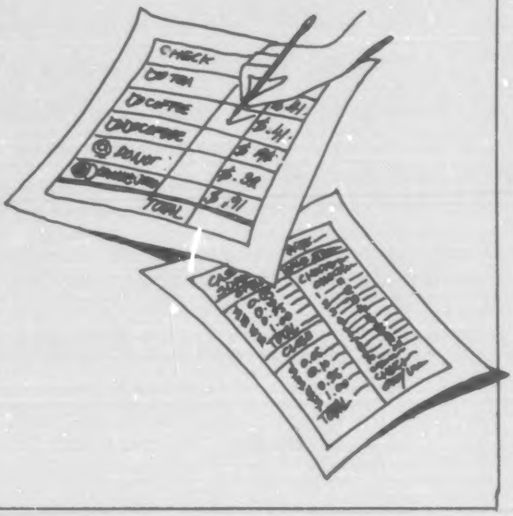
coffee
tea
cream
sugar
juice
doughnut

$.01-$10.00

Activity

DAY 1: JOB SKILLS

Students train in the skills needed for each job. (Bring in a sample of items on the materials list.)



Dishwasher: Prepare dishwashing equipment. Name each dish as you wash, rinse, and dry it.

Waiter/Waitress: Set the table. Learn the names of the food. Practice filling out checks. Give the checks to the cook.

Cook: Read the check. Practice making coffee and tea. Prepare food for serving.

Cashier: Count the money in the cash box and fill in a receipt form. Total the prices on sample checks. Practice giving change. Total a cash receipt form at the end of the day.

Language

DAY 2: LANGUAGE FOR THE JOB

Repeat the tasks of Day 1. Play the roles of customers and employees. Without using real food, have students come in order, eat, and pay.

Waiter/Customer

W: Can I help you?
C: Give me a ______.
W: Anything else?
C: No, that's all.
C: Give me the check, please.
W: Here. Please pay the cashier.

Employee/Supervisor

E: Come here, please. I have a problem.
S: What's wrong?
E:
  a. Look at this.
  b. I need a ______.
  c. I don't understand.

Cashier/Customer

C: Give me your check, please
C: Here you are.
C: That's __dollars and __cents.

Employee/Employee

E: Your food is ready.
I need more ________.
Can you help me.

Activity

DAY 3: CHOOSING A JOB

Talk about jobs which need to be filled for the simulation. Students pick a job they will perform on the next day and discuss and sign a job contract.

PRE-EMPLOYMENT RESTAURANT
EMPLOYEE CONTRACT

1. The employee begins work at ____ and leaves at____. Employees should sign in on time.
2. Employees who work an 8 hour day have a 45 minute lunch break.
3. There is a 10 minute break during the morning and the afternoon shift, scheduled by the supervisor.
4. If an employee is sick and cannot come to work, he/she should call the office at least 2 hours before the time scheduled to begin work.
5. After working for 1 year the employee receives 10 days paid vacation.
6. Employees give 2 weeks notice before quitting the job.
7. Employees receive a 50% discount on all food sold at the restaurant.
8. Employees cannot smoke cigarettes on the job. There is an employee lounge where smoking is permitted.
9. An employee should check with the supervisor if problems arise and before leaving the work site.
10. Information about insurance, benefits, and union membership is available from the manager.

If you agree to this contract, please sign below.

Job Title	Signature	Date

Activity

DAY 4: OPENING THE RESTAURANT FOR CUSTOMERS

Invite students from other classes or friends to come to the restaurant to play the role of customers. Bring enough food to serve them. Here's what happens.

1. Students sign in, go to their work station and begin preparations for opening.
2. When the tables are set, the money in the cash box counted, and food prepared, the supervisor can open business.
3. The waitress greets the customers, gives them a menu, seats them and takes their orders. The waitress gives the check to the cook. The cook returns the check with the prepared food. When the customers are finished they take their checks to the cashier. The cashier reads the check, takes the money and gives the customers the correct change. The cashier keeps the checks.
4. The supervisor closes the restaurant before the end of class and instructs students to clean up, fill in the cash receipt form, and put away the equipment. Employees check with the supervisor before signing out.

ACME
DISHWASHER
INC.
TRASH

INTERACTIONS

It is possible to ask customers to present students with some typical problems they may encounter on the job. These can be discussed on the following day. A customer could demand food that is not on the menu, return food that he/she doesn't like or give the cashier a $100 bill and ask for change.

A Restaurant Simulation

Notes

Preparation

Props. Have students make tablecloths, napkins, caps and aprons as a sewing project.

Forms. Food order checks, cash receipt forms and employee contracts can be made and duplicated.

More Jobs. You can create more jobs by having some students play the role of buspeople and hosts/hostesses. (You can also eliminate the role of dishwasher by using paper plates and cups.)

Customers. Choose customers who speak English fairly well and encourage them to engage in small talk with your students.

Activity

Explain to students that you will perform the role of a job supervisor. You may sometimes act the "angry boss" telling people to hurry up or making sure that they follow company rules.

Make sure students understand that the job contract is only a sample. They may or may not have to sign a contract if they get a job in a restaurant and contracts vary.

Language

Adapt It. The language suggested for this lesson can be adapted to fit the level of your students and the jobs you choose, by writing additional short dialogs.

Cultural Exploration

Follow-up Activity. After the simulation, ask your students to describe any problems they encountered on the job. Have them discuss the responsibilities of various jobs and the role of the supervisor. What do they need to learn before they could apply for a job in a restaurant and work successfully?

More Simulations

Teachers can plan other simulations that provide a work or home related application of the skills activities. These can be taught in the native language or in English. They can be designed to require one day or several days. A hardware store simulation gives students a chance to practice using money and to review the names of tools. Assembly line simulations, such as putting together locks, making curtains, or contructing boxes, can be planned. Home repair or post office mailroom simulations are other ideas.

Numbers Lessons

Playing with a Calculator

NUMBERS 1

Calculator 1

Students turn a calculator on and off and experiment with pressing various buttons.

Purposes

To get to know an electronic tool which will be used in future lessons.

To learn from each other.

Tools and Materials

calculator	1 each

Language

What's this? It's a calculator.

Put the calculator here.
over there.

A

What are these? They are calculators.

B

calculator
number

put
turn on
turn off
press

Procedure

1. Turn the calculator on and off.
   Press the numbers.
2. Look at some of the other symbols.
   Press the buttons to see what happens.
3. Share with others some things you discovered about the calculator.

Notes

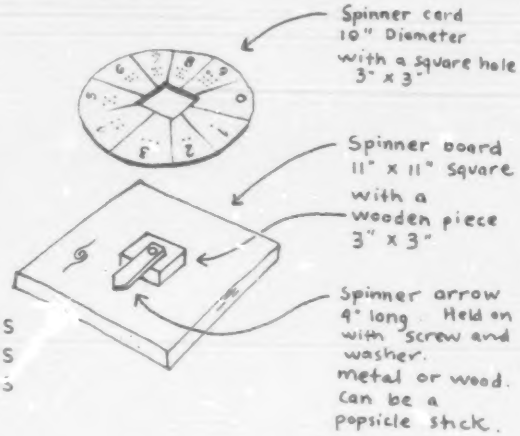
1. It is important to allow students to experiment with the calculator on their own. Future lessons will show students how to use it. Here encourage self-discovery by asking students to answer their own questions.
2. For step 3, have the students use their native language if necessary.

Number Recognition: 1 to 9

NUMBERS 2

Spinner 1

Students spin, count the number of dots on Spinner Card 1, say the number and take that number of bottlecaps.


Spinner card
10" Diameter
with a square hole
3" x 3"
Spinner board
11" x 11" Square
with a
wooden piece
3" x 3"
Spinner arrow
4" long Held on
with screw and
washer.
metal or wood.
Can be a
popsicle stick.

Purposes

To show the meaning of numbers 0-9 via dots and bottlecaps.

To read numbers 0-9.

To follow a set of rules.

Tools and Materials

Spinner Card 1	1 per class
Spinner board	1 per class
bottlecap	200 per class

Language

Spin the arrow.
Count the dots.
How many? 6
Take 6 bottlecaps.

You're next.

A

Who's next? I'm / He's / She's next.

B

dots
bottlecaps

count
take

0-9

Procedure

1. Spin the arrow.
2. Read aloud the number the arrow points to.
3. Take that number of bottlecaps.
4. Take turns until everyone has played.

Notes

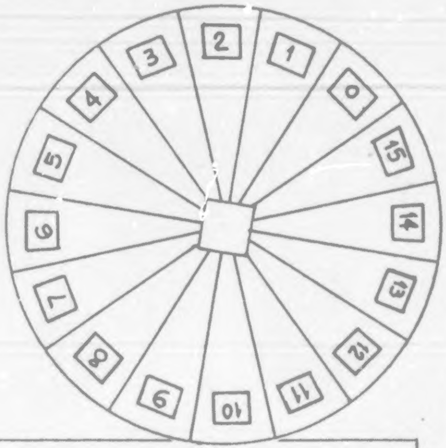
1. This activity can be repeated many times, until students can recognize the numbers and respond without hesitation.

Number Recognition: 1 to 15

NUMBERS 3

Spinner 2

Students spin the arrow on the Spinner Card 2, read the number the arrow lands on, and take that number of bottlecaps.



Purposes

To recognize and read number 1-15.

To count 1-15 objects.

Tools and Materials

Spinner Card 2	1 per class
Spinner board	1 per class
bottlecap	200 per class

Language

Spin the arrow.
Read the number.
Take 3 bottlecaps.
A

Who's next?	I'm He's next. She's You're
Who's first? last?	I'm first. last.

B

arrow
number
bottlecaps

spin
count
read
take

1-15

Procedure

1. Spin the arrow.
2. Read aloud the number the arrow points to.
3. Take the same number of bottlecaps.
4. Take turns until everyone has played.

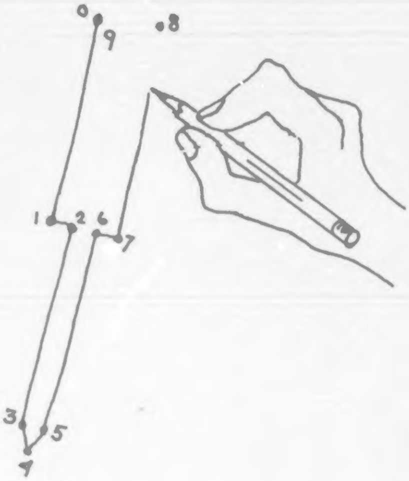
Notes

1. If students are having trouble with Spinner Card 2, go back to Spinner Card 1.

What Number is Next?

NUMBERS 4 **Counting 1**

Students draw lines from one number to the next and finish with a picture.



Purposes

To practice number recognition (0-9).

To make a drawing by following numbers in a sequence.

To use a straight edge and a pencil.

Tools and Materials

straight edge	1 each
pencil	1 each
eraser	1 each
"follow the number" drawings	1-6 each

(See Appendix: Handouts)

Language

Start here.
Draw a line from 0 to 1.
What number is this? It's 1.
A

What number is before 3? 2
What number is after 3? 4
B

pencil
paper
straight edge
number
line

start
draw

0-9

Procedure

1. Use the straight edge and pencil to complete a drawing. Draw lines between numbers 0-9 in sequence.
2. Repeat this procedure for other drawings.

Notes

1. Make more "follow the number" drawings of objects. Tools they have used or objects in the classroom are a good idea, because you can compare the picture with the object itself.

Introducing Equals

NUMBERS 5 **Counting 2**

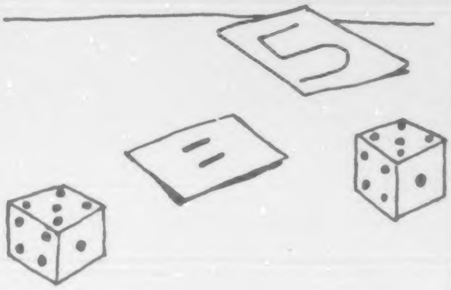
One student throws a die. A second student throws another die until it matches the first number, and then makes a number "sentence" using flashcards and an equals sign card.

Purposes

To match dots with numbers 1-6.

To show equality using the symbol =.

To make a simple number sentence.



"FIVE EQUALS 5."

Tools and Materials

dice	2 per class
number flashcards 1-6	2 of each
"equals" symbol card	1 per class

Language

Throw the die.

What number is it? It's 3.

Are they equal? They're equal.
not equal.

3 equals 3.

A

Throw it again

Are they the same? They're the same.
different? different.

B

die
dice
number card
equals card

throw
take
count

1-6

Procedure

1. Throw a die and find the matching number card.
2. Throw the other die until you match the first number.
3. Make a number sentence by putting the equals card between the two number cards.
4. Read the sentence aloud.

Notes

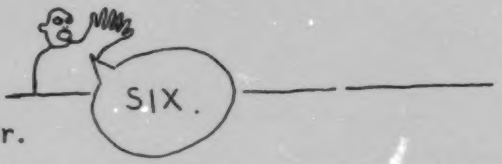
1. Have each student throw both dice and say the total number of dots, or write the total on a form.

Numbers 0 to 9 on a Calculator

NUMBERS 6

Calculator 2

A number is given to students, who find and press the same number on the calculator.



Purposes

To follow instructions to put numbers 0-9 on the calculator.

To press the ON, OFF, CLEAR and number buttons on a calculator.

Tools and Materials

calculator	1 each

Language

Find number 7.
Press it.
Clear the calculator.
A

What number is before 6. Number 7.
after
B

calculator
number

clear
turn on
turn off
give me

0-9

Procedure

1. Listen to a number repeated two times.
2. Find that number on the calculator and press it.
3. Read aloud the number on the screen.
4. Clear the calculator and wait for the next number.

Notes

1. Write number on the blackboard instead of saying it aloud.
2. Follow this procedure to teach numbers from 10-20.

How Many Parts?

NUMBERS 7 **Parts 1**

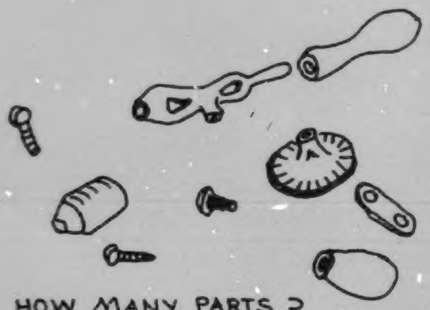
Students take apart a hand drill and put the parts together.

Purposes

To understand what is meant by "part."

To take apart an object.

To count parts.


HOW MANY PARTS ?

Tools and Materials

hand drill	3 per class
screwdriver	3 per class

Language

Show me one drill.
part.

Take apart the drill.

How many parts? 3 parts.

A

How many parts are there?
There are 3 parts.

Which part is the biggest? This one.
smallest? That one.

B

take apart
put together
tighten
loosen

1-10

Procedure

1. Remove one part of the hand drill. Guess how many parts the drill has.
2. In groups, take apart a drill. Count the number of parts.
3. Put the pieces back together to make a drill.

Notes

1. Use other objects that have less than 10 component parts.
2. Exchange parts from one drill (the screws, for example) with parts from another drill to show that they are interchangeable.

Measuring without a Ruler

NUMBERS 8 **Measurement 1**

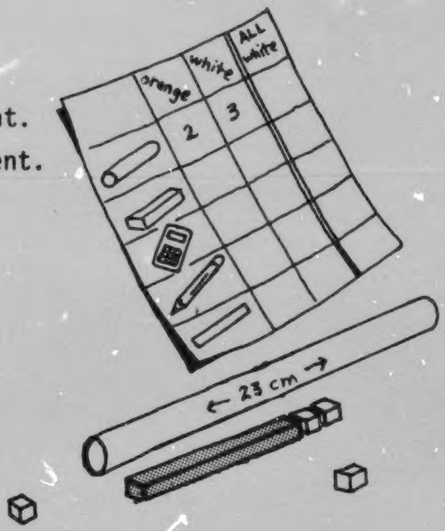
Students measure pipes, wood, rods and other objects. Using white and orange Cuisenaire rods as the units of measurement.

Purposes

To estimate and measure the length of objects.

To use blocks as a unit of measurement.

To use a form to write down measurement.



Tools and Materials

pencil	1 each
white rod (1 cm)	10 per class
orange rod (10 cm)	10 per class
PVC pipe (23 cm)	1 per class
wood (42 cm)	1 per class
calculator	1 per class
straight edge	1 per class
measurement form	1 each

Language

How many rods? 3

What color is the rod? It's orange.

How long is the pipe?
It's 3 orange rods long.

A

Guess how long it is.
It's 3 orange rods and
2 white rods long.

Fill in the form.

B

rod
pipe
wood
calculator
straight edge

orange
white

1-5

measure
count
write

Procedure

1. Measure an object using orange and white rods.
2. Write the numbers of white and orange rods on the form.
3. Repeat the procedure with the rest of the objects.

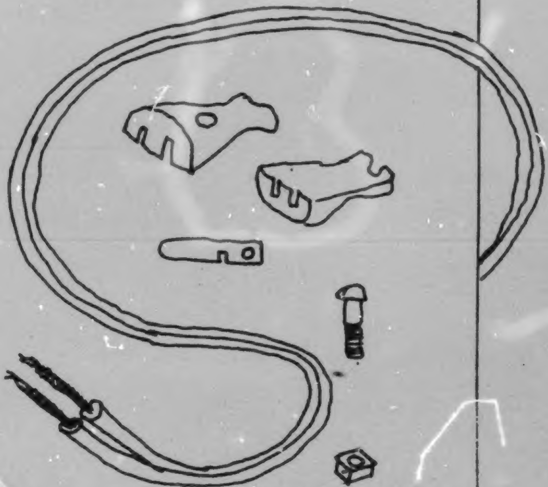
Notes

1. Have the students guess the length before they measure and write this estimate down to compare with their measurement.
2. Fill in only the first two columns of the forms. Have students write their names on the forms to use in a later lesson.

Parts and Wholes

NUMBERS 9 **Parts 2**

Students break down an extension cord into parts and indicate which parts can be combined into wholes.



Purposes

To emphasize what is meant by a part of one object.

To identify and count parts.

To associate parts with the appropriate whole.

Tools and Materials

extension	1 per class
plug	2 per class
socket	2 per class
lampcord	1 per class
screwdriver	2 per class

Language

Give me 1 part of the extension.

Is this a part of the extension? Yes, it is.
No, it isn't.

Put all the parts of the extension here.

A

What's this a part of?
It's a part of the extension.

B How many parts are there? There are 6 parts.

extension
plug
socket

give me
put together
take apart

1-20

Procedure

1. Break the extension cord down into the most number of parts possible. Count and group the parts.
2. Group the parts of the plug.
3. Group the parts of the socket.
4. Group the parts of the extension cord.

Notes

1. Have students identify parts of whole objects in the classroom.

Several Equal Parts

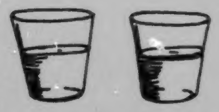
NUMBERS 10 **Parts 3**

Some things can be divided into parts which are equal. Water and paper are the two examples used in this lesson.

Purposes

To divide objects into different numbers of equal parts.

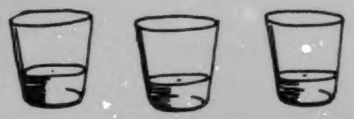
To recognize that the word "part" can be applied to things that can be divided equally and to things that cannot.



2 EQUAL PARTS

Tools and Materials

pitcher of water	1 per class
cup	5 per class
white paper	4 each



3 EQUAL PARTS

Language

How many parts? 2 parts.

Are they equal? They are equal.
They are not equal.

Give him 2 equal parts.

A

Are these the same or different?
They are the same.
They are different.

B

part
cup
pitcher
paper

give
fill
fold

1-10

Procedure

1. Fill a cup with water. Then pour this water into other cups to get 2, 3, 4 or 5 equal parts.
2. Ask for and give each other different numbers of equal parts of water.
3. Fold a sheet of paper to make two equal parts. Then make four equal parts.
4. Decide on a number of equal parts. Fold sheet of paper to make that number of equal parts. Find other ways of folding to get the same result.

Notes

1. Bring in a hand drill to show that all objects cannot be divided into parts which are called equal.

Measuring with an Arbitrary Unit

NUMBERS 11

Measurement 2

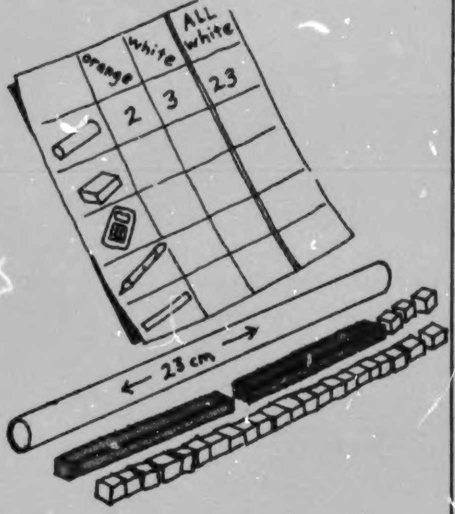
Using the form from Lesson 8, students measure the lengths of objects with the white rods. Then they measure the orange rod to discover that there are ten white rods in every orange one.

Purposes

To estimate, measure and record lengths of objects.

To use rods as a unit of measurement.

To develop the concept that ten shorter units equal one longer one.



2 orange + 3 white = 23 white

Tools and Materials

pencil	1 each
white rod	50 per class
orange rod	1 per class
PVC pipe (23 cm)	1 per class
piece of wood (42 cm)	1 per class
calculator	1 per class
straight edge	1 per class
measurement form	1 each

Language

How many rods? 23

What color is the rod? It's white.

How long is the pipe?
23 white rods long.

A

How many white rods equal one orange rod?
10 white rods equal one orange rod.

Guess how many.
Fill in the form.

B

rod
pipe
piece of wood
calculator
straight edge

white
orange

measure
count
write
show me
10-42

Procedure

1. Estimate how many rods long an object is. Write down the estimate.
2. Measure each one using the white rods.
3. Write the number of rods on the form.
4. Repeat the procedure for the other objects. Measure the orange rod last.

Ten Equal Parts

NUMBERS 12 **Parts 4**

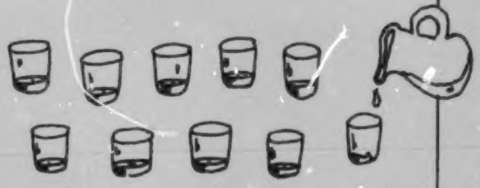
Students make ten equal parts of a pitcher of water, a lampcord and a box of nails.

Purposes

To divide objects into equal parts.

To count the parts.

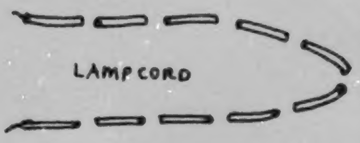
To recognize that ten parts of an object can equal one whole.



10 EQUAL PARTS

Tools and Materials

lampcord (1-2 meters long)	1 per class
clothes pin	9 per class
pitcher of water	1 per class
cup	10 per class
nail	1 box per class
wire cutter	1 per class



Language

Make 10 equal parts of the water.

Check them.

Are they equal? They are equal.
not equal.

A

Ask him who has 8 equal parts.
her

Who has 8 equal parts? I do.
He/She does.

B

water
lamp cord
nails

make
count
show me

1-10

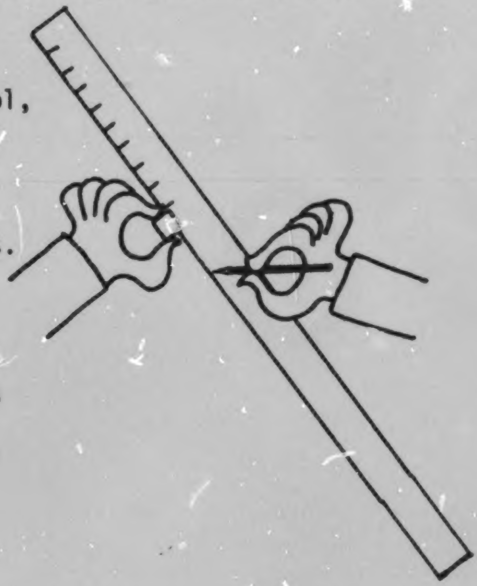
Procedure

1. Make ten equal parts of the water using cups. Ask for and give each other different numbers of equal parts.
2. Divide a lampcord into 10 parts which are exactly equal. Use clothes pins as markers.
3. Divide a box of nails into 10 equal parts. Count the nails in each part.

Making a Centimeter Ruler

NUMBERS 13 **Measurement 3**

Each person makes a paper ruler which is 30 rods long, using the white rod as the unit of measurement. Then students measure some objects using their ruler.



Purposes

To make a standard measurement tool, using white rods.

To learn that a ruler has equally spaced divisions.

To number each of the 30 divisions.

Tools and Materials

white rod	2 each
pencil	1 each
scissors	2 per class
poster paper (marked into strips)	1 sheet

Language

Make equal spaces.

Use the rods.

Is this one longer? Yes, it is.
No, it isn't.

How long is your ruler? It's 30 rods long.

A

What is the length? The length is 17.

B

rod
space
ruler

make
cut
measure
use

1-30

Procedure

1. Cut a strip from a piece of poster board.
2. Use the white block and a pencil to mark equally spaced line divisions on the bottom edge of the strip.
3. Cut the strip so it is 30 rods long, and number each mark.
4. Measure some objects and report the length.

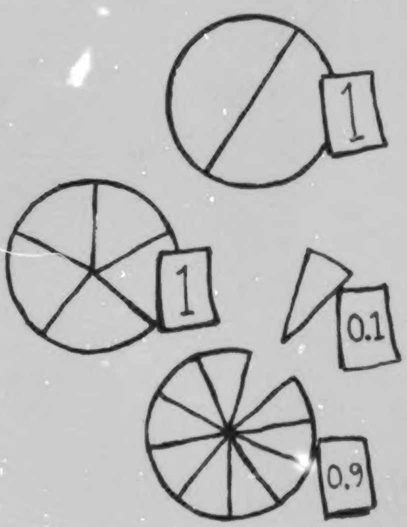
Notes

1. Have students write their names on the rulers for use in other lessons.

Expressing Ten Equal Parts

NUMBERS 14 **Parts 5**

Students label parts less than a whole using decimal numbers from .1-.9 and cardboard circles.



Purposes

To read the symbols .1-.9.

To review the meaning of equal parts.

To use decimals to identify parts less than a whole.

Tools and Materials

cardboard circle	
with 2 parts	1 per class
with 5 parts	1 per class
with 10 parts	1 per class
number cards .1-.9	1 set per class
number card 1	3 per class

Language

Do you have a whole circle? I have a whole.
part of a circle? part.

X: Do you have one-tenth?
Y: Yes, I do. (No, I don't.)
X: Give it to me.
Y: Here.
X: Thanks.

A

How much do you want? I want one-tenth.

Can you write one-tenth? Yes, I can.
No, I can't. Show me.

B

one-tenth
two-tenths
-
nine-tenths

.1-.9

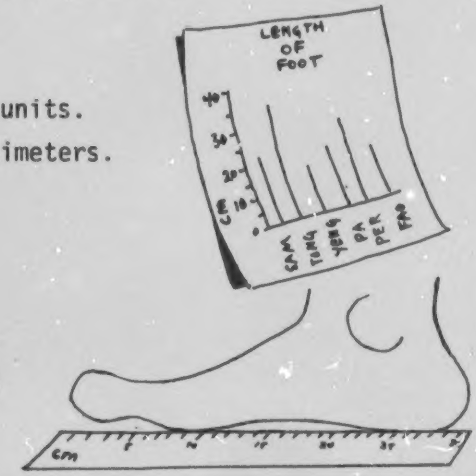
Procedure

1. Put a number card marked "1" next to each circle.
2. Put away the circles with 2 and 5 parts. Take out one part of the circle with 10 parts. Label it with .1.
3. Take out another part of the circle and add it to the part just removed. Label this section .2. Continue removing parts from the original circle, and adding them, making sections .3 to .9 in size. Label the size of each section as you go.
4. Practice asking for and making sections of different sizes. Choose the number card that goes with each section you make. Guess how many tenths are in the other size sections and then see if you're right.

Using Your Ruler

NUMBERS 15 **Measurement 4**

Students learn that each space on their rulers is a standard length, one centimeter. They make a bar graph to report and compare measurements of their feet.



Purposes

To recognize and name centimeter units.

To use a ruler to measure in centimeters.

To use a bar graph.

Tools and Materials

student ruler	1 each
pencil	1 each
piece of paper	1 each
white rod	10 per class

Language

A

From here to there is 1 centimeter.

How many centimeters from here to there?

How long is your foot? It's 24 centimeters.

B

Whose foot is longest? _____'s foot.

Whose foot is longest? Mine.
His.
Her.
Yours.

centimeter
ruler
foot

take
measure
write

1-30
CM

Procedure

1. Write CM on the end of your ruler. Measure your foot with it.
2. Write down the number with the abbreviation CM next to it.
3. Make a bar graph. Write the numbers 0-30 in a column on the blackboard. Write students' names in a row across the bottom.
4. Put the length of each student's foot on the bar graph. Compare lengths.

Plus and Minus

NUMBERS 16 **Spinner 3**

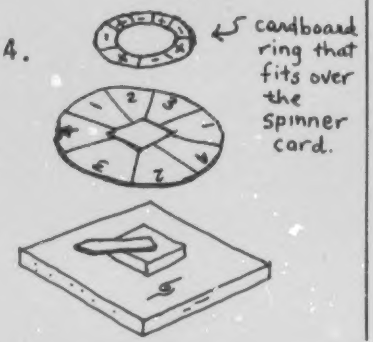
Each student spins the arrow on spinner card 3 and adds or takes away bottlecaps from his or her pile by reading the symbol + or -.

Purposes

To learn the functions of symbols + and -.

To add and subtract using numbers from 1 to 4.

To report addition and subtraction.



Tools and Materials

Spinner board	1 per class
Spinner Card 3	1 per class
bottlecap	200 per class

Language

Spin the arrow.
Plus 3. Add 3 bottlecaps.
Minus 2. Take away 2 bottlecaps.
How many do you have now? I have 3.
Whose turn is it? It's my turn.
A

What did you do? I added 3 bottlecaps.
took away
B

add
take away

my
your
his
her

+
-
0-30

Procedure

1. Each person takes 10 bottlecaps.
2. Spin the arrow.
3. Read aloud the symbol (+ or -) and the number.
4. Take away or add that number of bottlecaps.
5. Continue until one person runs out of bottlecaps.

Building a Whole with Tenths

NUMBERS 17 **Spinner 4**

Students match cards of decimal numbers (.1-.9) with white rods. They then spin the arrow on Spinner Card 4 and take that number of "tenths" rods until one student makes "one."

Purposes

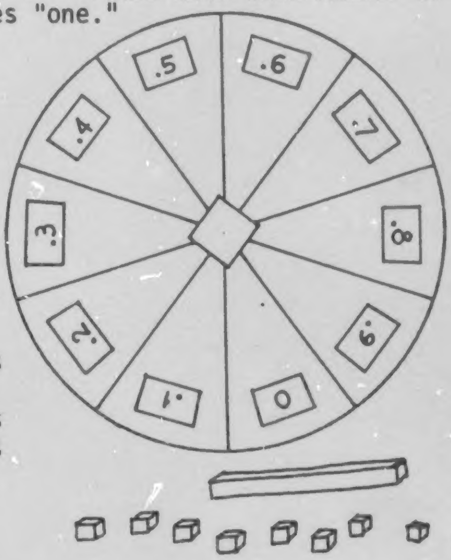
To read numbers with a decimal.

To identify parts of a whole from one-tenth to nine-tenths.

To use parts one-tenth in size to construct a whole.

Tools and Materials

white rod	75 per class
orange rod	1 each
Spinner Card 4	2 per class
Spinner board	2 per class
number cards (.1 to 1)	1 set



Language

A

Is this one-tenth of a block? It's one-tenth.
No, it isn't.

Show me one whole.

You win!

B

How many tenths do you have? I have one-tenth.

How many more do you need? I need nine more.

one-tenth
two-tenths
nine-tenths

.1-.9

Procedure

1. Put the card with number 1 next to the orange rod to show the "whole."
2. Match the number cards .1 to .9 with the right number of white rods ("tenths").
3. Spin the arrow and read the number of tenths indicated on the spinner-card and take that many white rods.
4. Play until someone gets exactly ten tenths, no more. Exchange the ten tenths for an orange rod, the "whole."

Notes

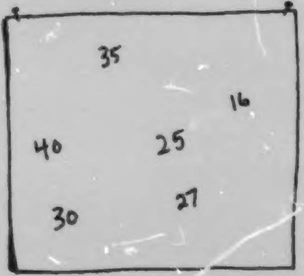
1. Play the game again to make two or three wholes.

Estimating and Adding

NUMBERS 18

Calculator 3

Students estimate the number of candies in a jar and use the calculator to add up the totals.



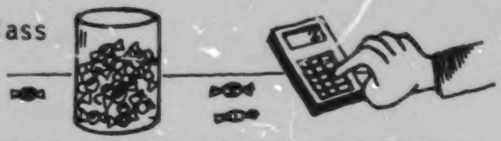
Purposes

To use the + and = functions on a calculator.

To use the calculator to add by ones.

To develop judgement in estimating quantity.

candy, wrapped	30-40 per class
calculator	1 each
glass jar	1 per class



Language

Guess how many candies there are. There are 25.

How many are there? There are 25.

Are there 25? Yes, there are.
No, there aren't.

Add 20 plus 1. 20 plus 1 equals 21.
Press 1.
Press equals.

A

How many do you think there are?
I think there are 25.

How many more are there? There are 25 more.

B

candies
pieces

guess
add
count

1-30

Procedure

1. Guess how many candies are in the jar. Write your guess down.
2. Take a candy from the jar. Press 1 on the calculator. Take a second candy. Press the plus button and then the number 1 again. Press the equals button and read the number.
3. Repeat until all the candies are counted. Compare the total with your guesses.

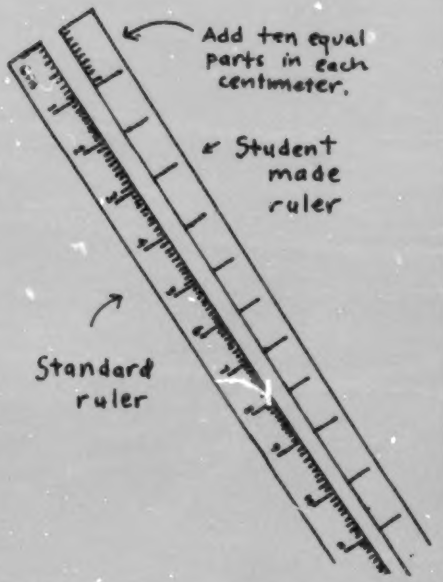
Notes

1. Advanced classes repeat the activity, counting in groups of two, three or five.

Refining Your Ruler

NUMBERS 19 Measurement 5

Students divide the centimeter spaces on their rulers into ten equal parts. They name parts from one-tenth of a centimeter to two centimeters.



Purposes

To compare and adjust student-made rulers against a standard.

To divide a standard unit (one centimeter) into ten sub-units.

To measure things that are one centimeter and part of another centimeter long.

Tools and Materials

student ruler	1 each
pencil	1 each
eraser	1 each
pencil sharpener	1 per class
masking tape	1 roll per class
ruler (CM only, cover inches with tape)	1 each
CM./MM. ruler chart*	1 per class

*preparation required before class

Language

Make 10 equal parts.

How long is it? It's one-tenth of a centimeter.

A

How long is it? It's one and three tenths centimeters.

Write it. 1.3 CM

B

one-tenth
two-tenths
-
nine-tenths
.1-.9
one and one tenth
one and two tenths
-
one and nine tenths
1.1-1.9
CM

Procedure

1. Tape a standard ruler to each student worktable. Put a student ruler next to the standard ruler so the lines match up. Erase and move any marks that do not.
2. Draw nine equally spaced lines between each centimeter on your ruler. Finish all 30 centimeters.
3. Look at a large chart of a ruler. Name the parts from one-tenth of a centimeter to one centimeter. Name the lengths from one centimeter to two centimeters.

Making Two Wholes

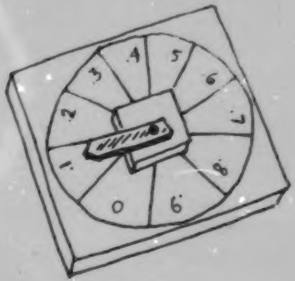
NUMBERS 20 Spinner 5

A whole rod is orange. A rod one-tenth its length is white. The two tenths length rod is red and the five-tenths is yellow. Students spin the arrow and take a rod which has the same value as the decimal number on the board. The goal is to make two wholes.

Purposes

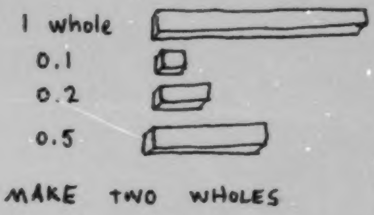
To use parts one-tenth, two tenths and five-tenths in size to construct a whole.

To name amounts that are one whole and part of another whole. (e.g. one and two-tenths).



Tools and Materials

white rod	25 per class
red rod	25 per class
yellow rod	25 per class
orange rod	1 each
Spinner Card 4	2 per class
Spinner board	2 per class



Language

How many tenths do you have?
I have one-tenth.

Do you have more than two whole rods?
less than
Yes, I do.
No, I don't.
A

How many more do you need?
I need one-tenth more.
B

one-tenth
two-tenths
-
nine-tenths
.1-.9

one and one-tenth
one and two-tenths
-
one and nine-tenths
1.1-1.9

Procedure

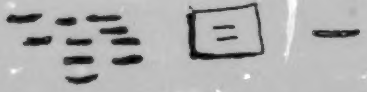
1. Use different combinations of red, white and yellow rods to make a whole.
2. Spin the arrow, read the amount shown on the board and take the right number of red, white or yellow rods.
3. Continue until one student gets exactly two whole rods.

Ten of These Equals One of Those

NUMBERS 21 **Spinner 6**

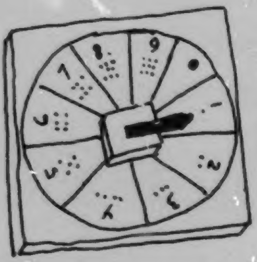
Ten black bottlecaps equal one white one. Students use Spinner Card 1 to learn that the value of one object can be worth ten of another, the concept behind units of money.

Purposes



To learn that one object can have a value of more than one.

Tools and Materials



black bottlecap	80 per class
white bottlecap	40 per class
Spinner board	1 per class
Spinner Card 1	1 per class
"equals" symbol card	1 per class

Language

How many black bottlecaps do you have? I have 3.

Who has 10 bottlecaps? I do.
You do.
He does.
She does.

Who has the most?

A

Who goes first? I go first.

B

black
white

first
second
third
next
last

0-50

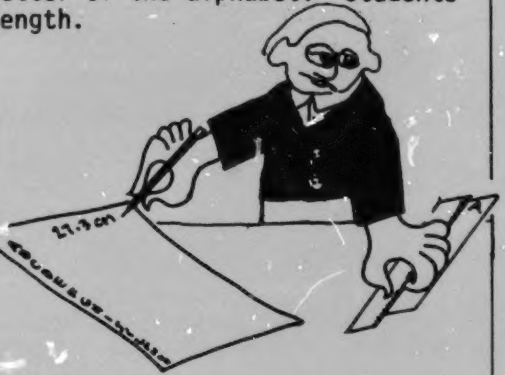
Procedure

1. Ten black bottlecaps equal one white. Put the "equals" sign between the black and white bottlecaps and read the sentence.
2. Spin the arrow and read the number. Take that number of black bottlecaps. When you get ten bottlecaps, exchange them for a white one.
3. Continue playing until all the white bottlecaps are gone. Count the number of bottlecaps you have.
4. Talk about the bottlecaps, e.g. "I have 2 white and 7 black. It equals 27 black."

Measuring to the Nearest Millimeter

NUMBERS 22 Measurement 6

In this lesson there are 20 strips of paper of varying lengths. Each strip is labeled with a different letter of the alphabet. Students measure each strip and record the length.



Purposes

To measure length accurately to the nearest tenth of a centimeter.

To record whole numbers and decimal numbers.

To identify and write letters A-T.

Tools and Materials

student ruler	1 each
pencil	1 each
white paper	1 each
paper strips *	20 per class

* Each strip about 2 cm. wide; each a different length up to 30 cm. Label every strip with a letter from A to Z.

Language

Write the letters on your paper.

Make a column. Like this.

How long is A ? It's 3.5 centimeters.

A

Who has A ? I have A .
needs need

May I have A , please? Sure.
Just a minute.
Ask him.
her.

B

column
letter
number
centimeter

write
make
measure
put

A
A-T

2.5-29.9

Procedure

1. Write the letters A through T in a column on your paper.
2. Measure a strip and write the length next to the right letter on the paper.
3. Exchange strips with another student. Repeat the procedure until you have measured all 20 strips.

Notes

1. Check the answers by having students read and write the correct lengths on the blackboard.

Adding One by One

NUMBERS 23 **Calculator 4**

Students take a handful of bottlecaps and use the calculator to find the total. They put that group aside and find the total of another two handfuls of bottlecaps. They add the totals of all the small groups of bottlecaps to find the grand total.

Purposes

To add small amounts using a calculator.

Tools and Materials

bottlecap	200 per class
calculator	1 each
glass jar	1 per class

Language

Take 3 bottlecaps.
Press 3 on the calculator.
Take 2 more bottlecaps.
Add 3 plus 2.

What does 3 plus two equal? 3 plus 2 equals 5.

How many all together? 5

Add two groups of bottlecaps.

A

How many did you take?	I took 3.
What number did you press?	I pressed 3.
What numbers did you add?	I added 3 plus 2.
What was the total?	It was 5.

B

bottlecap
group
plus
equals

guess
take
count
press
add

1-10

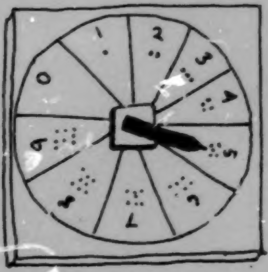
Procedure

1. Take a handful of bottlecaps from the jar and count them. Take a second handful and do the same. Add these two numbers on the calculator. Put the bottlecaps together in a group.
2. Repeat this procedure until the jar is empty.
3. Use the calculator to add the groups to get the total number of bottlecaps.

How Much is it Worth?

NUMBERS 24 **Spinner 7**

Black, red, and yellow bottlecaps are used to represent coins in the American money system (1¢, 5¢, 25¢).



Purposes

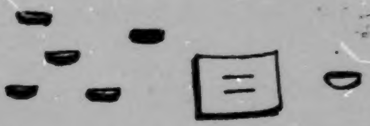
To recognize that two objects of the same size can have a different value.

To exchange objects according to their value.

To "make change" with bottlecaps of different values.

Tools and Materials

bottlecap	
black	80 per class
red	80 per class
yellow	20 per class
"equals" sign card	2 per class
Spinner board	1 per class
Spinner Card 1	1 per class



Language

A

How many blacks equal one red? 5

Change 5 blacks for one red.

How many reds do you have now? I have 5.

Can you change the blacks for a red? Yes, I can. / No, not yet.

B

How many did you have? I had 26.

Who had the most? Orawan had the most.

black
red
yellow

spin
take

1-50

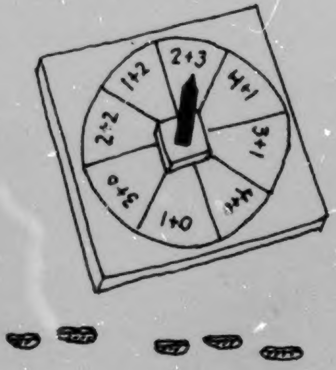
Procedure

1. A black bottlecap is worth 1, a red 5 and a yellow 25. Exchange bottlecaps according to these values.
2. Spin the arrow and take that number of bottlecaps. As soon as you can, exchange bottlecaps to get as many red and yellow ones as possible.
3. Continue playing until a student gets a yellow bottlecap.

Adding Small Numbers

NUMBERS 25 Spinner 8

Students spin the arrow to read and solve simple addition problems and take the correct amount of bottlecaps.



Purposes

To read and solve addition problems.

Tools and Materials

Spinner board	1 per class
Spinner Card 5	1 per class
bottlecap	200 per class

Language

How much does 1 plus 2 equal?
1 plus 2 equals 3.

How many bottlecaps do you have?
I have 3 bottlecaps.

A

How many bottlecaps did you have?
I had 10.

B

spin
take
add
count

0-9

Procedure

1. Spin the arrow.
2. Read aloud the addition problem and the answer.
3. Take that number of bottlecaps.
4. Continue playing until all students have participated.

Notes

1. Repeat this game until students can add the numbers quickly and accurately.

Length and Width

NUMBERS 26

Measurement 7

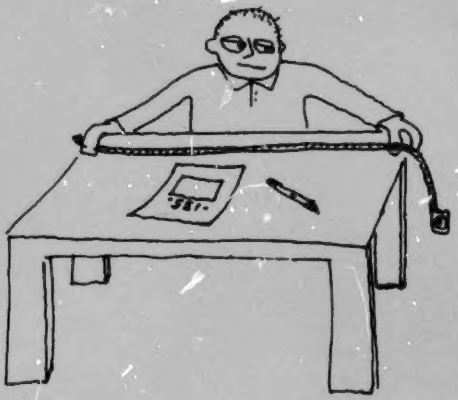
Students use a tape measure to find the length and width of classroom objects and write the dimensions on their drawing of that object.

Purposes

To use a tape measure to measure length and width in centimeters.

To draw a simple picture in two dimensions.

To write measurements.



Tools and Materials

tape measure (metric)	3 per class
pencil	1 each
paper	2 each
ruler (metric)	1 each.

Language

Measure the length.

What is the length?
The length is 135 centimeters.

Draw a picture.
Write the length and width.
A

Which one is longer? This one is longer?

What are the dimensions?
87 centimeters by 64 centimeters.
B

length
width

longer
the longest
shorter
the shortest

1-300

CM

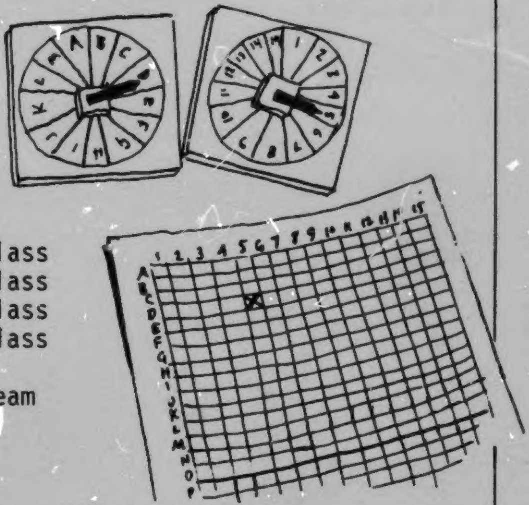
Purposes

1. Measure the length and width of the top of a table. Make a drawing and write the measurements on it.
2. Draw a simple picture of an object in the classroom that is square or rectangular, such as a window, door, wall or poster.
3. Measure the dimensions of the object you have chosen and write them in the correct place on your picture.

A5, Z7, M9

NUMBERS 27 **Spinner 9**

Working in teams, students spin and read letter and number combinations from Spinner Cards. They use each letter-number combination as an alphanumeric code to find a square on a grid.



Purposes

To read alphanumeric codes.

To say letter-number combinations aloud.

Tools and Materials

Spinner board	2 per class
Spinner Card 2	1 per class
Spinner Card 6 (A-M)	1 per class
Spinner Card 7 (N-Z)	1 per class
grid (on blackboard)	
colored chalk (3 colors)	1 per team

Language

What letter is this? It's A.
What number is that? It's 3.
What is the code? It's A3.

Find square A3 on the grid.
Write an X.

How many A codes do you have?
I have 5.

A

What letter does this code start with?
It starts with A.

B

A
A - Z
3
1 - 15

Procedure

1. Spin the arrows on both boards to get a letter and a number.
2. Say the code aloud.
3. Put an X in the square on the grid that corresponds to the code. Each team uses a different color of chalk.
4. Continue playing until one team gets 5 codes that start with the same letter.

Notes

1. Label tools with alphanumeric codes. Have students spin and then locate the tool with that code.

Adding Larger Numbers

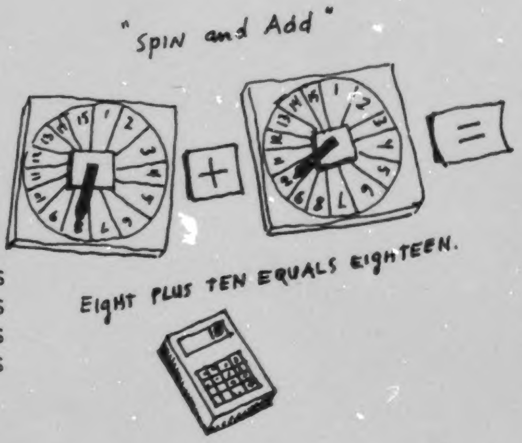
NUMBERS 28 **Spinner 10**

Two Spinner boards are on the table. There is a plus sign in between the boards and an equals sign to one side. Students spin numbers and then use the calculator to add the total.

Purposes

To use a calculator to add one and two digit numbers.

To read a number sentence that includes the symbols + and =.


"Spin and Add"
+
=
EIGHT PLUS TEN EQUALS EIGHTEEN.

Tools and Materials

calculator	1 each
bottlecap	200 per class
Spinner board	2 per class
Spinner Card 2	2 per class
"plus" card	1 per class
"equals" card	

Language

Spin one arrow.
the other

What does 2 plus 3 equal? 2 plus 3 equals 5.

Add them on the calculator.

Check it. Count the caps.
Are the numbers the same? They're the same.
different.

A

Did you add yet? Yes, I did.
No, not yet.

B

add
count
spin

1-30

Procedure

1. Spin the arrow on one Spinner board. Put that number of bottlecaps above the Spinner board. Do the same with the other Spinner board.
2. Add the numbers on the calculator.
3. Check the total by comparing the number on the calculator screen with the total number of bottlecaps.
4. Repeat until everyone has played.

Notes

1. Play the game Las Vegas style. Pick a few numbers between 2 and 30. Students try to equal that number.

Your Height

NUMBERS 29 **Measurement 8**

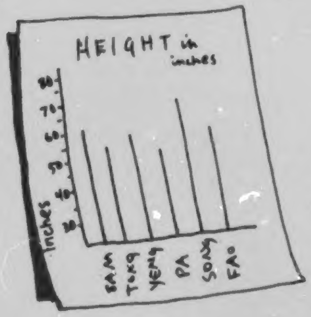
Students measure their heights in centimeters and inches, then make a bar graph of everyone's height in inches.

Purposes

To measure, read and record height in inches.

To compare and discuss the uses of centimeters and inches.

To make a bar graph of students' heights.



Tools and Materials

meter stick	1 per pair
tape measure (inches)	1 per class
pencil	1 per pair
paper	1 per pair
poster paper	1 per class
marker	2 per class
ruler (inches)	1 per pair

Language

How many centimeters tall are you?
I am 132 centimeters tall.

Write _____ centimeters.

Who is the tallest? Tem is the tallest.

A

How many inches in one foot?

How tall is he? He is 5 feet 3 inches tall.
she? She

B

centimeters
inches
feet

the tallest
the shortest
taller
shorter
tall
short

CM
" (inches)

1-150

Procedure

1. Stand next to the blackboard. Make a mark to indicate your height. Use a metric ruler to measure your height in centimeters. Write the heights on the blackboard.
2. Use a ruler marked in inches to measure the height of students. Write the heights on the blackboard. Compare the difference between one inch and one centimeter.
3. Make a bar graph on poster board of students' heights in inches (from tallest to shortest).

Notes

1. Have students guess the measurement in inches of their heads, waists, feet, etc. Check with the tape measure.

Small Money

NUMBERS 30 **Spinner 11**

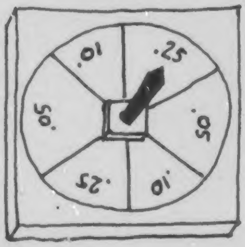
The symbols and names for U.S. money are presented through Spinner Card 8. Students spin, take coins and exchange them until someone gets two quarters.

Purposes

To recognize a penny, nickel, dime, and quarter, and the value of each.

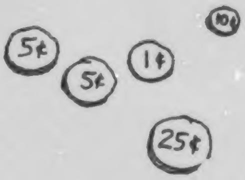
To count coins and exchange coins of equivalent value.

To read the symbols for coins.



Tools and Materials

penny	50 per class
nickel	40 per class
dime	30 per class
quarter	24 per class
Spinner Card 8	1 per class
Spinner board	1 per class
"equals" sign card	1 per class
container for money	1 per class



Language

How much do you have? I have a penny.

How many cents does it equal? It equals one cent.

Find the number for one cent. $ .01.

A

Try to make 2 quarters.
How much money do you have? I have 25 cents.

Can you make change for a quarter? Yes, I can.
Sorry, I can't.

B

penny
nickel
dime
quarter
cent

$ .01
$ .05
$ .10
$ .25

$.01-
$.74

Procedure

1. Make a number sentence by putting the "equals" sign between groups of coins that have the same value. Make change with different kinds of coins.
2. Spin the arrow. Take that amount of cents in one coin. Exchange coins for one with greater value when you can.
3. Play until someone gets two quarters.

A Dollar

NUMBERS 31

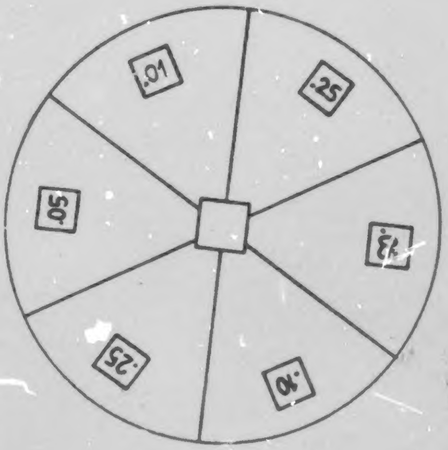
Spinner 12

Using Spinner Card 8, students recognize and read amounts of money from one cent to a dollar and combinations of a dollar and cents.

Purposes

To read and write combinations of dollars and cents.

To make combinations of coins to equal a dollar.



Tools and Materials

nickel	40 per class
dime	30 per class
quarter	24 per class
dollar	20 per class
Spinner board	1 per class
Spinner Card 8	1 per class
calculator	optional

Language

How much is this?	It's 85 cents.	
Write 85 cents.	$.85.	
How many cents in a dollar?	100 cents.	
Make one dollar. Show me.		
A		
How many coins do you have? dollar bills	I have 3 coins and 2 dollar bills.	
B		

dollar
quarter
nickel
dime

$.01-$1.00

1-100

Procedure

1. Find a few coins that can be combined to equal a dollar.
2. Spin the arrow and take the amount indicated. The first student to get one dollar or more wins.

Notes

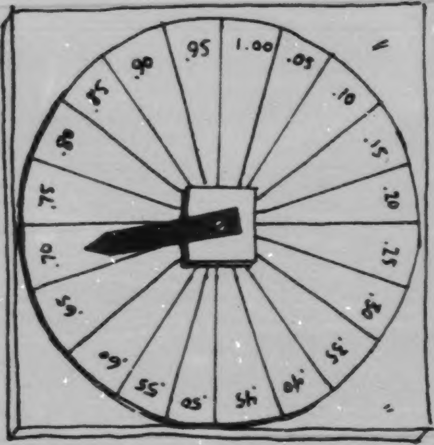
1. Have students make an inventory of all the coins at the beginning of class. Count and take inventory again when class is over.
2. Continue playing until a student gets two dollars and fifty cents or more.

Bigger Money

NUMBERS 32 **Spinner 13**

Students spin and take pennies, nickels, dimes, and quarters to equal the amount on Spinner Card 9.

Purposes



To recognize coins and number symbols for U.S. money.

to combine coins of different values to equal a given amount of money.

Tools and Materials

penny	50 per class
nickel	40 per class
dime	30 per class
quarter	24 per class
dollar	20 per class
Spinner board	1 per class
Spinner Card 9	1 per class
pencil	1 each
paper	1 each

Language

How much is that? It's 70 cents.
What do you need? I need 70 cents.
How many cents does a quarter equal?
A quarter equals 25 cents.
Do you need any quarters? Yes, I do.
No, I don't.
A

Can you give me change for a quarter?
Yes, I can.
Sorry, I can't.
How much change do you have? I have ___ cents.
B

quarter
penny
nickel
dime

$.05-$3.00

Procedure

1. Combine coins to make the amounts on Spinner Card 9.
2. Decide the amount of money a student will have to get to "win."
3. Spin the arrow. Take the coins which equal the amount the arrow points to.
4. Continue playing until someone wins.

Your Weight

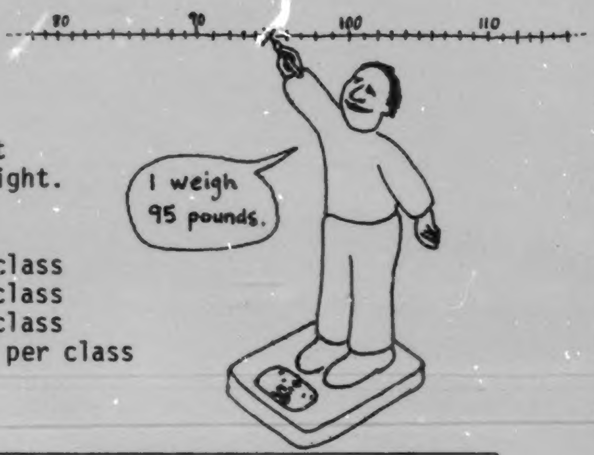
Students measure their weight in pounds and mark it on a number line. They make a list of their names, in order of weight, from lightest to heaviest.

Purposes

To measure, read and record weight in pounds.

To make a number line that shows students' weights.

To make a list of names that is in order of people's weight.



Tools and Materials

bathroom scale	1 per class
marker	2 per class
paper	15 per class
masking tape	1 roll per class

Language

Look at the scale.		lightest heaviest lighter heavier light heavy
How much do you weigh?	I weigh 95 pounds.	
How much does he weigh? she	He weighs 95 pounds. She	
Write your name.		1-200
Write 95 pounds.	Like this: 95 LB.	
A		
Who is the lightest?	Vang is the lightest.	LB.
B		

Procedure

1. Draw a number line from 0-200 on many sheets of paper taped to each other along the wall.
2. Get on the scale. Have two students read the scale, and agree on your weight. Mark your weight on the number line and your name next to it.
3. Compare who is lightest and heaviest. Put names and weights on a list on the blackboard, with the lightest person's name at the top.

Notes

1. Bring objects to class. Guess their weights, weigh them and make a list from lightest to heaviest on the blackboard.

Trial and Error

NUMBERS 34

Counting 3

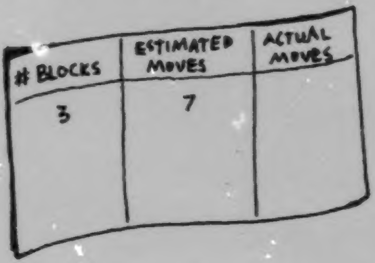
Students play a game of logic moving colored wooden blocks on three pieces of paper. The object of the game is to move a stack of blocks from 1 piece of paper to another in the fewest number of moves.

Purposes

To write numbers on a form.

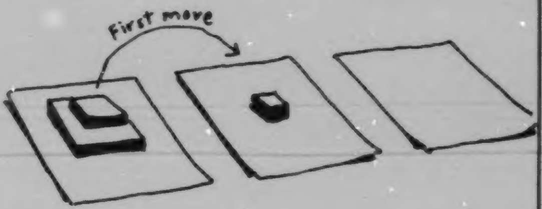
To test your guess.

To work within a set of rules.



Tools and Materials

pencil	1 each
score sheet	1 each
wooden blocks (Cuisenaire Rods) blue red white green yellow	1 per pair
paper (8½ x 11)	3 per pair



Rules

1. Move only 1 block at a time.
2. Move only the top block in a stack.
3. Make only one stack on a paper.
4. Put only small blocks on top of larger blocks.
5. Move only on the paper squares.

Language

Move the block 1 space.

Put the red block on top.

Count the moves.

How many blocks? 4.
How many moves? 19.
Write it down.

A Guess how many moves.

Can you do that? You can do that.
You can't do that.

What is the least number of moves?
B 15 is the least.

red
green
yellow
white
blue

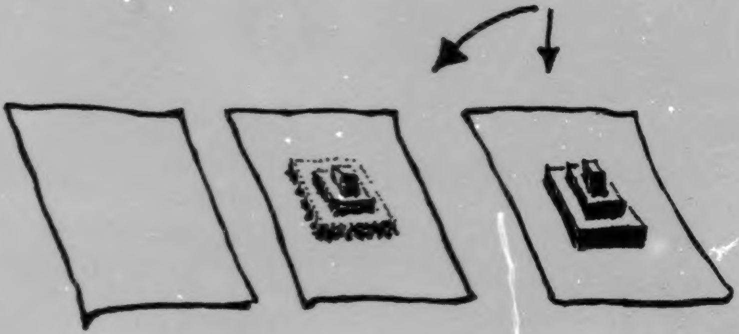
on top
on the bottom
in the middle
on the right
on the left

1-30

Trial and Error

Problem

Move the stack of blocks from the paper on the right to the paper in the middle.



Procedure

1. Move the blocks from one paper to another.
2. Count the number of moves it takes.
3. Write down the number on the score sheet.
4. Move the blocks back to the original paper. Count and record the moves.
5. Add another block and repeat the procedure. This time estimate the number of moves. Write your guess and the results on the score sheet.

Notes

1. Continue the game by adding a block to the stack, until students are working with 5 blocks.
2. Have the students work in pairs and compare their results.

Lesson Planning

There are many ways to plan a lesson--as many ways as there are teachers. What is important is that you find a system for planning that helps you with your teaching. For some teachers, this means writing everything down in great detail. For others, it means making a few notes of special activities. Other teachers make their plans right after a class has ended. What is the system that works best for you?

Even though there are many ways to write a plan, all effective lessons contain a minimum of key elements:

1. Content: what the lesson is about; what the students are to learn; the subject matter.
2. Purposes: what the students are to do with the content; the objectives.
3. Techniques: the activities and procedures you use to help the students learn.
4. Assessment: an opportunity for students to show you what they have learned; to help you decide what to do next.

In planning, you need to take these elements into account in some way. You also need to consider the needs, abilities and personalities of the students. And you need to consider how much time is available to you to teach the lesson. The clearer and more conscious you are about these elements, the more effective and purposeful your plans--and your teaching--can become.

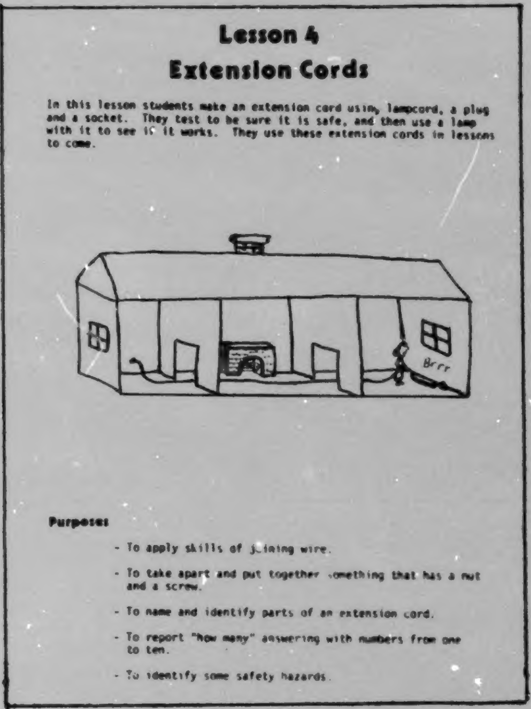
In addition to these elements, your lesson plan also reflects the principles you hold about learning, teaching and the subject matter. Your beliefs or opinions about how people learn will affect your choice of objectives, techniques, what and how you assess--even what you choose to teach.

On the following pages, there is a sample lesson plan for one lesson in the curriculum. It is presented to show you one way to plan. It is not the only way, nor is it the best way. Use it to help you define your own planning system for this and the other lessons in the curriculum.

How would you plan this lesson?

Lesson Planning

Study Lesson 4 below   How would you plan this lesson?



Lesson 4
Extension Cords

In this lesson students make an extension cord using lampcord, a plug and a socket. They test to be sure it is safe, and then use a lamp with it to see if it works. They use these extension cords in lessons to come.

Purposes

- To apply skills of joining wire.
- To take apart and put together something that has a nut and a screw.
- To name and identify parts of an extension cord.
- To report "how many" answering with numbers from one to ten.
- To identify some safety hazards.

4 Extension Cords

Tools and Materials

razor knife	1 each
screwdriver	1 each
wire cutter	2 per class
plug	1 each
socket	1 each
lampcord* (various lengths up to 2 meters)	1 each
test light*	1 per class
lamp	1 per class

* preparation required before class

Language

How many wires? One wire.

Plug in the extension cord.

A

How many wires are there? There is one.
are two

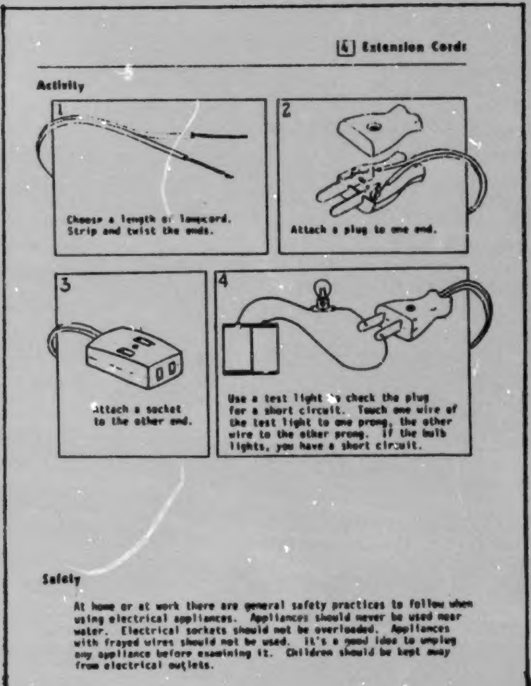
B

wire
screwdriver
razor knife
extension cord

plug in
unplug
pick up
show me

one
two
ten

DANGER



4 Extension Cords

Activity

1 Choose a length of lampcord. Strip and twist the ends.

2 Attach a plug to one end.

3 Attach a socket to the other end.

4 Use a test light to check the plug for a short circuit. Touch one wire of the test light to one prong, the other wire to the other prong. If the bulb lights, you have a short circuit.

Safety

At home or at work there are general safety practices to follow when using electrical appliances. Appliances should never be used near water. Electrical sockets should not be overloaded. Appliances with frayed wires should not be used. It's a good idea to unplug any appliance before examining it. Children should be kept away from electrical outlets.

4 Extension Cords

Notes

Preparation

Lampcord. The first time you teach this lesson, cut the lampcord into 1½-2 meter lengths. When you teach the lesson again, take apart the extension cords students have made. Cut off the stripped ends and reuse the wire.

Test Light. You will need a test light for this activity. To find out how to make one, see Lessons 9 and 12.

Activity

See the Lesson Planning section for options in teaching this lesson. Encourage students who are having problems making their extension cords to watch someone who is doing it correctly. After students have finished their extension, show them samples of ones which were especially well-made.

Safety

Short Circuit. To show students how dangerous electricity can be, demonstrate a short circuit using an extension cord (see Appendix : Electricity).

Establish a routine of taking an inventory of tools and materials with the students at the beginning and at the end of class. See Lesson 15 for a sample inventory form and suggestions for incorporating it into lessons.

Language

Spinners. Put an assortment of tools and materials on the table. Use a spinner board and Spinner card 1 (numbers 1-9) and a set of flash cards with pictures of the tools and materials. Students turn over a card and spin the arrow. They then take that number of the item on the card. Students ask and answer question (e.g. "What's that?" "How many?"). (See Appendix: Handouts for picture of tools.)

Long Answers. Use structures with "there is" and "there are" for more advanced students and add additional conversational language (e.g. "How many are there in your family?") Have them answer in complete sentences.

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Write your plan in the space below:

LESSON PLAN

Warm-Up	Greet the students. Engage them in small talk.
Inventory	Remove the tools and materials from the container and put them on a table in front of the class. As you take them from the container, ask the question, "How many?" Elicit the appropriate answer (e.g. "one, two, three"). Continue asking this question as you put the tools and materials on the table.
Question-Answer	With all the tools and materials on the table, have the students ask and answer questions about them, using "how many?" One student points to one item (or more) and asks, "How many?" The student who answers then points to other items and asks another student.
Requesting Information	Point to a tool or material and ask, "What's this?" Elicit the response, "I don't know." Don't provide the names of the items. Encourage students to ask if they want to know the names (e.g. "What's this?" "It's a wire.").
Present the Activity	Show students a completed extension cord. Point to the materials they need to make one. Give each student the tools and materials. Ask each one to make an extension cord like the model ("Make one like this.")
Making the Product	Students work on the task. Circulate to check their work. Point out students whose work is accurate.
Testing the Product	Check the extension cords with a test light. Show the student who finishes first how to use the test light to check the cord. If the student's extension is good, give the test light to that student, who becomes the "tester" of the others' extension cords.(If the extension is not good, tell the student to fix it.) Have students whose cords are not working look at one which is made correctly to help them fix theirs. Encourage students to help each other ("Can you help her?").

Using the Product

As students finish their cords, have them attach the cords one by one to a lamp. Give the first student instructions (e.g. "Plug in the extension.") to attach the extension cord to the lamp. Then tell the student, "Turn on the lamp." If the lamp lights, the cord works. This student then tells a second student to do the same things. The second tells a third, and so on--until all students do it.

Action Sequence

Take the lamp to one end of the room where there is no outlet. Indicate that you cannot plug in the lamp. Ask one student to plug in his/her extension into the lamp. That student asks another, and so on until all the cords form a long chain. Finally, plug the extensions into an outlet and turn on the lamp. Have students repeat the procedure to unplug their cords ("Unplug the extension.").

Vocabulary

Gather students around the table where there are a screwdriver, a wire, a razor knife and an extension cord. Ask students, "Pick up the ____," and "Show me the ___." Students respond with the appropriate action. Have students give each other instructions.

Game

Divide students into two teams to play a game. Two members from each team come before the class. Show them a picture of an item. They must give the command so that one of their team picks up that item. (Give points for correct commands and responses.)

Inventory

Put the container for the tools on the table. Students pick up the tools, count them and put them away. Give students instructions ("Pick up the screwdrivers."), then ask them, "How many?" When they give the correct answer, point to the container and tell them to put the tools away (Put the screwdrivers over there."). Continue until everything is put in the container.

Safety Demonstration

To show the students the dangers of a short circuit, take apart one socket on an extension cord and connect a single strand of wire to the wrong screw. Ask the students to stand back. Then plug in the extension, so that students can see the blue flame caused by the short circuit. Give appropriate warnings ("Be careful!").

Through an interpreter aide, explain the short circuit to the students. After the explanation, ask them:

How can you prevent a short circuit?

FOLLOW-UP

Guessing Game. For additional practice with the language, put pictures of the tools and materials on flashcards. On another set, put the numbers 1-10. A student comes before the class and takes a card from each pile. Not showing it, he/she asks the class, "What is this?" They guess by saying, "It's a ___." The student answers with "Yes" or "No". Once they guess the item, the student then asks, "How many?". The class guesses until they get the right number. Continue with another student.

Find the Number. Put pictures of various numbers of extension cords on flashcards. Distribute a set of these cards to students in groups of 4. Students ask each other how many materials are needed to make that number of cords (e.g. "How many wires?", "How many screws?").

Tell Me What. To practice the instructions, play a game where the students mime certain steps of the activity (e.g. "Unplug the extension.", "Turn on the lamp.", "Be careful!"). The others must guess the action. Vary this by making it a contest between teams. Set a time limit for students to mime the actions.

Numbers Lesson. Teach the next numbers lesson in the sequence. Use the lesson as an opportunity to practice language from the lesson (e.g. "What's this?", "Can you help him/her?").

VARIATIONS

Activity

Demonstration. Instead of allowing the students to find out how to make an extension cord on their own, show them how to do it. Take apart the socket, strip the wires, twist the ends and attach them neatly to the terminals and then reassemble the socket. Do the same for the plug. (Another option is to take apart just the socket.)

Making It Better. After all students have tested their extensions, show the students the inside of the model cord. Ask students to look inside their sockets and plugs and to make any changes if they see a need.

Participant. Participate in the task alongside students as a "helper". Don't direct their efforts, just give them a hand.

VARIATIONS (cont'd)

Language

Requesting Help. Before you begin the activity, teach the students a ritual for requesting help. Have the students memorize the lines and practice the ritual. Then, when the occasions arise during the activity, make sure that they use the ritual.

- Can you help me?
+ Excuse me?
- Help me, please.
+ Sure.

Vocabulary. In presenting the tools and materials, pass them around so that all students can examine them silently. Have them listen as you repeat the name of each one. Then involve them in actions, by giving commands (e.g. "Pick up the ____."). Next, ask the students to name the tools ("What's this?").

Pronunciation. Include a brief pronunciation exercise at the end of the lesson.

Lesson

Rationale. Begin the lesson by telling the students what the purpose of the lesson is and why they are doing the activity.

Feedback. At the end of the lesson, ask the students to state what they have learned. Allow them time to think about the question. Don't force them to talk if they are not ready.

NOTES

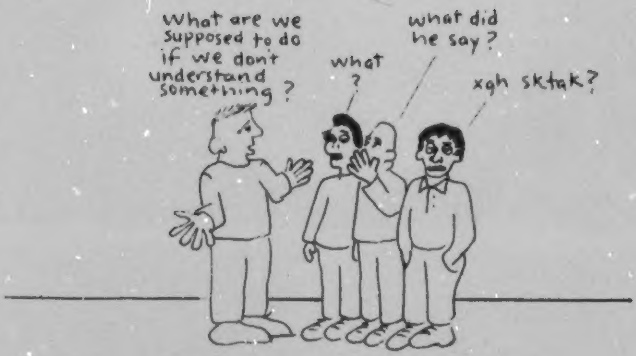
Use an Inventory Form which students fill out before and after the activity.

For demonstration purposes, bring in a faulty extension cord so that the student "tester" knows how to spot a bad cord with the test light. Use this cord for the demonstration of the short circuit.

Compare your lesson plan with the one above.

How was your plan the same? Different?

Why?


What are we supposed to do if we don't understand something ?
what ?
what did he say ?
xgh sktak ?

Techniques

How do you teach? What are the exercises, the activities, the procedures that you use in class to make it easier for the students to learn? Every teacher collects a number of techniques which fit his/her personality and which reflect his/her beliefs about learning and about how people learn best. This section contains a selection of basic teaching techniques that many teachers have found useful and effective.

These techniques are presented as a resource list, not as the answers to all your teaching challenges. It is not a comprehensive list; there are many other techniques and activities that you can also use. The techniques do not reflect or "belong to" any particular methodology or teaching approach. The main thing that they have in common is that they emphasize students' participation in class.

The techniques are arranged in categories, which correspond to different jobs in teaching. These categories show that techniques can be used for a particular purpose, e.g. for presentation or for class management. Many techniques, however, can be used for more than one purpose. Demonstration, for example, is listed as a technique for presentation, but it can also be used for correction, assessment--even for giving instructions. The categories are:

1. Presentation
2. Explanation
3. Correction
4. Class Management
5. Structured Practice
6. Activity Operation
7. Communication
8. Communication Games
9. Cultural Exploration
10. Pronunciation
11. Literacy
12. Assessment

The descriptions of the techniques are brief and are intended to give you the basic information about how and why to use them. You will need to adapt them to fit the subject matter and the students you are teaching. You will also have to choose when to use them and how to incorporate them into your lesson plan.

Of course, knowing which techniques you want to use is only part of the answer to the question of how to teach. You need to be able to carry out the techniques--you need to be able to do them. It is not always the techniques that make a teacher effective; more often it is the teacher who makes techniques effective.

Techniques

Presentation

1. Objects
2. Pictures
3. Demonstration
4. Definition
5. Situation
6. Translation
7. Images

Explanation

1. Deduction
2. Induction
3. Reflection

Correction

1. Recognition
2. Cues

Class Management

1. Large Group
2. Small Groups
3. Individuals
4. Instructions
5. Interpreter Aides

Structured Practice

1. Repetition
2. Substitution
3. Transformation
4. Question-Answer
5. Charts
6. Spinners
7. Action Sequence
8. Reconstruction

Activity Operations

1. Operation

Communication

1. Dialogues
2. Constructalog
3. Cummings Device
4. Picture Story
5. Spiel
6. Narrative
7. Recitation
8. Characters

Communication Games

1. Twenty Questions
2. Concentration
3. Go Fish
4. Cubes

Cultural Exploration

1. Role Play
2. Open-Ended Story
3. Valuation
4. Depictions
5. Picture Interpretation
6. Simulation
7. Songs
8. Proverbs

Pronunciation

1. Minimal Pairs
2. Oral Cues
3. Visual Cues
4. Sound Contrast
5. Directed Repetition
6. Minimal Sets

Literacy

1. Copying
2. Dictation
3. Scrambles
4. Hangman
5. Tic Tac Toe
6. Bingo

Assessment

1. Picture Description
2. Open-Ended Task
3. Interview
4. Feedback
5. Matching
6. Cloze
7. Skits
8. Dyads

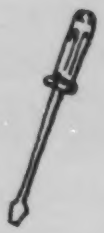
The purpose of these techniques is to convey meaning--to help students understand. The focus, what the student needs to understand, can vary. It might be a new sound, a piece of information, a step in an activity or a new word.

OBJECTS

Students associate language with an object.

Procedure

1. Indicate the object to students.
2. Give/Elicit the word for the object.



Follow-Up

Repeat the procedure if students did not understand.

Options

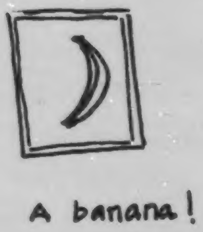
Students hold or touch the object.

PICTURES

Students associate language with a visual image--a picture, a photograph or a drawing.

Procedure

1. Indicate the picture to students.
2. Give/Elicit the word or expression.

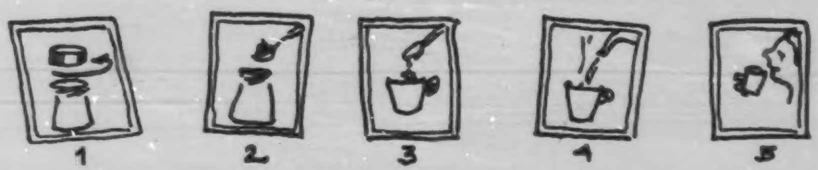


Follow-Up

Check students' understanding by asking them to produce the language.

Options

Use pictures to show students what to do--instead of what to say, e.g. a picture of the steps in an activity.



Techniques: Presentation

DEMONSTRATION

Students associate meaning with actions.

Procedure

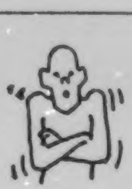
1. Perform the action.
2. Elicit/Give the word or expression.

Follow-Up

To check students' understanding, have them perform the action.

Options

Combine actions with objects or pictures.



It's cold.

DEFINITION

Students associate new meanings from language they already know.

Procedure

1. Say the new word or expression.
2. Give/Elicit the definition.

Follow-Up

Students give the definition.

Options

Use synonyms and antonyms.

Hungry.

When I'm hungry, I want to eat.

SITUATION

Students get the meaning of a word or expression through the description of a context or situation.

Procedure

1. Describe a situation.
2. Give/Elicit the new word or expression.

Follow-Up

Students re-tell the situation.

Options

Include pictures, objects or demonstrations.

Jon is going to the movies. A ticket costs \$2. Jon has \$1.50. Jon can't see the movies. Why not?

He doesn't have enough money.

TRANSLATION

Students associate new words or expressions with those of their own language.

Procedure

1. Say the word or expression.
2. Give/Elicit the equivalent in the students' language.

Screwdriver.

Tourne-vis.

Follow-Up

Students translate the word back into the target language.

IMAGES

Students use their imagination to get at meaning by using Cuisenaire rods to represent objects, scenes or people.

Procedure

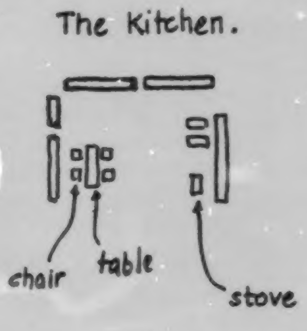
1. Arrange rods to symbolize a scene.
2. Describe the scene.
3. Give/Elicit the new word or expression.

Follow-Up

Students refer to the rods and say the new words or expressions.

Options

Include pictures or written symbols.

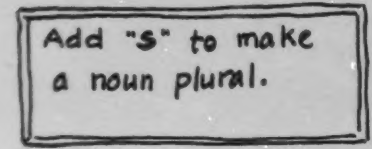


Techniques: Explanation

The purpose of these techniques is to help students to make sense out of the subject matter--especially to see relationships between parts. Usually, this means understanding the "rules" of subject matter, e.g. how to make words plural or how to make solid connections in soldering.

DEDUCTION

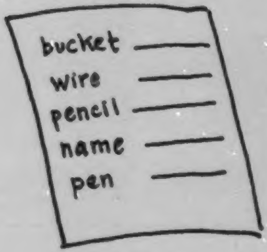
Students are given an explanation--a rule--and apply it to specific examples.



Add "s" to make a noun plural.

Procedure

1. Present the rule.
2. Give examples to the students.
3. Students apply the rule to the examples.



bucket ____
wire ____
pencil ____
name ____
pen ____

Follow-Up

Students give other examples that follow the rule.

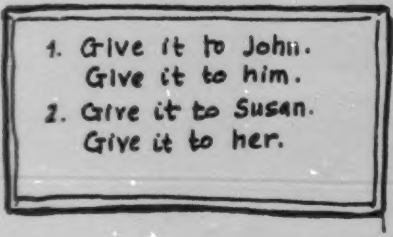
Students give exceptions to the rule.

Options

Give the rule and ask the students to provide examples.

INDUCTION

From a series of examples, students discover the explanation, the rule.



1. Give it to John.
Give it to him.
2. Give it to Susan.
Give it to her.

Procedure

1. Give examples to the students.
2. Students find the rule.

Follow-Up

Students give other examples that follow the rule.

Students give exceptions.

REFLECTION

From a random sample of examples, students find rules and make explanations for themselves.

Procedure

1. Put the subject matter before the students.
2. Ask students to make observations or explanations.
3. Tell students if their explanations are correct or not.

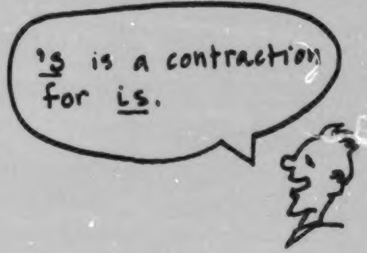
- What is your name?
- Lee. What's yours?
- Jan. Where do you live?
- I live in town.

Follow-Up

Students give other examples to support their explanations.

Options

Allow students to ask questions about the subject matter.


's is a contraction for is.

Techniques: Correction

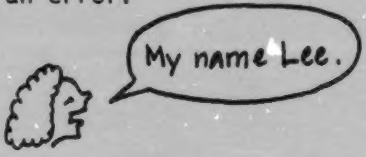
The purpose of these techniques is to point out errors to students and to provide cues to help students correct them.

RECOGNITION

Students realize that they have made an error.

Procedure

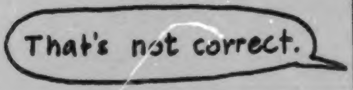
1. Call students' attention to the error.



Options

Make a note of the error and point it out later.

Tell the student that there is an error.

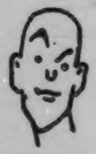

That's not correct.

Use gestures: shake your head.

wag your finger.

Use facial expressions:

raise your eyebrows.



Pause in silence to allow the student to find the error.

Note

You need to decide which errors to point out to the students and when to do this.

CUES

Students use cues to correct their errors.

Procedure

1. The student makes an error.

My name Lee.

2. Point out the error.
3. Give the cue.
4. The student works to correct it.

Options

Tell the student how to correct the error.

Put is in the sentence.

Demonstrate the correct form.

Use gestures.

Use symbols.

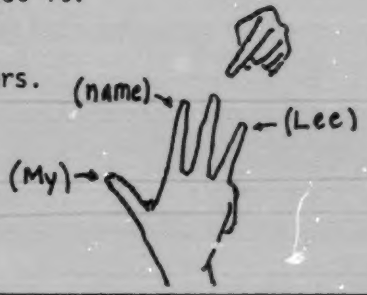
$\boxed{V}$ = verb

Use written language.

Indicate another student who has the correct form.

Pause in silence and allow the student to work to correct it.

Use your hands and fingers.



Techniques: Class Management

The purpose of these techniques is to help students work on specific tasks. They accompany other techniques as ways of relating to students and involving them in class.

LARGE GROUP

Students work on tasks together, as a class.

Procedure

1. Set the task.

2. Students participate.

Options

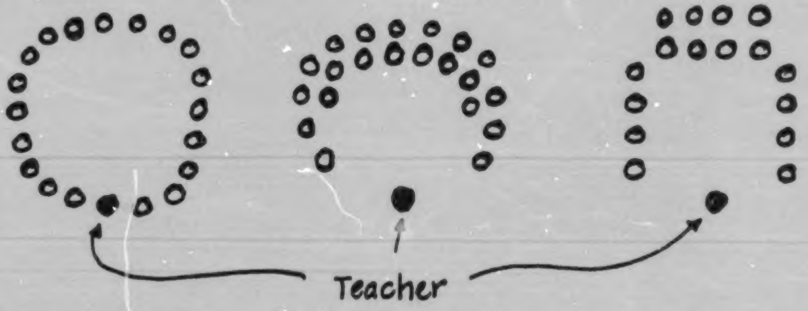
Students respond together.

Half the students respond.

Work with a small group,
with the rest of the students
as observers.

Work with one student, with the
rest of the students as
observers.

Choose a seating arrangement
which allows students to work
together.



SMALL GROUPS

Students work on tasks in groups of three, four or in pairs.

Procedure

1. Set the task.

2. Students participate.

Follow-Up

Students report on their tasks to the large group.

Options

Set a task which asks students to prepare one result.

Look at these pictures and make a dialogue.

Set a task which asks students to share individual results.

Describe your diagrams to each other.

Students work alone before working in small groups.

Choose a seating arrangement which allows students to work together.

Note

Working together in small groups calls for students to cooperate with each other.

INDIVIDUALS

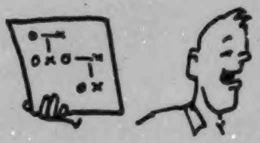
Students work alone on tasks.

Procedure

1. Set the task.
2. Students work individually.

Follow-Up

Students report on their tasks.



Draw a diagram of your family tree.

Options

Work with one student, with the rest of the students as observers.

Set different tasks for individual students, based on their needs and abilities.

Set different tasks for individuals, while working with the large group.

Allow individual students to set their own tasks.

INSTRUCTIONS

Students understand what they are supposed to do.

Procedure

1. Tell students what to do.

Listen and repeat.

Follow-Up

Check to see if students understood the instructions.

Options

Demonstrate the instructions.

Use gestures.

Use language which is at the students' level.

Students give a summary of the instructions.

Set time limits for activities.

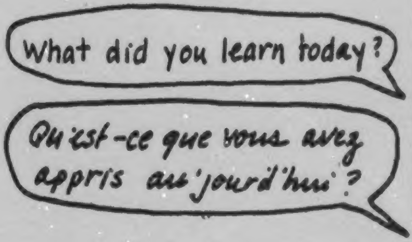
State a specific result that you expect from the activity.

State the purpose of the activity.

INTERPRETER AIDES

Teaching assistants translate what you and the students say so that everyone understands.

Procedure


What did you learn today?
Qu'est-ce que vous avez appris aujourd'hui?

1. You/Students speak.
2. Aide translates.

Options

Speak clearly and slowly.

Use language that the aide can understand.

Pause regularly for the aide to translate.

Repeat what you said, when necessary.

To make sure you have understood, summarize the aide's translations into English.

Before class, inform the aide of the content and objectives of your lesson.

Before class, review the material to be translated with the aide.

Note

Interpreter aides should not let their own opinions affect their translations.

Techniques: Structured Practice

The purpose of these techniques is to give students practice in manipulating the subject matter. Students work with a limited number of items, following a structured procedure to improve grammatical accuracy or develop expertise.

REPETITION

Students do something again--performing an action or saying a word or sentence.

Procedure

1. Students perform an action.
2. Students do it again.

Hello.
Hello.
Hello.

Follow-Up

Continue until students have got it right or until they need to stop.

Options

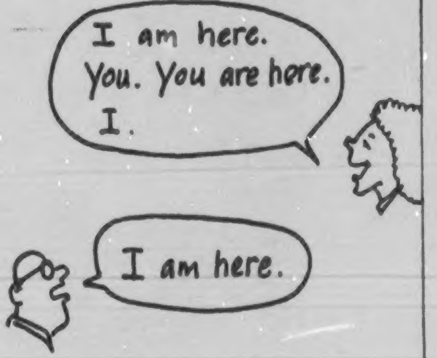
Students direct their own repetition at their own pace.

SUBSTITUTION

Students replace certain words or expressions in a sentence pattern.

Procedure

1. Present the model pattern and the cue.
2. Students make the substitution.
3. Continue with other cues.


I am here.
You. You are here.
I.
I am here.

Follow-Up

Students explain the rule.

Options

Students provide the words to be substituted.

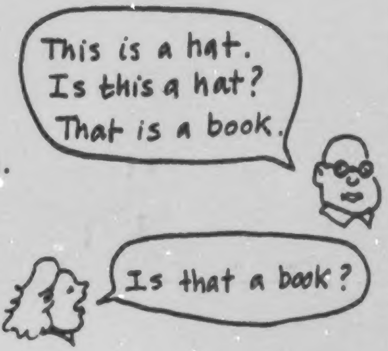
Use pictures as cues.

TRANSFORMATION

Students change sentences in a particular way--changing one sentence pattern into another.

Procedure

1. Present the model transformation.
2. Say the sentence.
3. Students change the sentence.


This is a hat.
Is this a hat?
That is a book.
Is that a book?

Follow-Up

Students change the transformations back to the original sentences.

Options

Students give other sentences which follow the model transformation.

QUESTION-ANSWER

Students ask and answer questions. The answers are controlled.

Procedure

1. Present the model question and answer.
2. Ask the question and give the cue.
3. Students answer.

What's that?
It's a book.

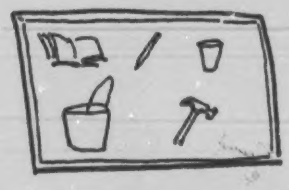
Follow-Up

Students ask the questions.

Options

Use pictures or symbols to cue student answers.

Use symbols to cue different kinds of questions.

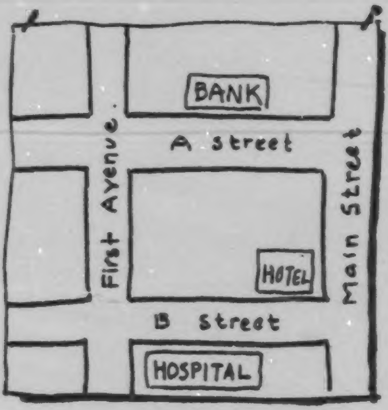


CHARTS

Students make statements or ask and answer questions based on information arranged on a wall chart.

Procedure

1. Present the information on the chart.
2. Students make statements about the chart.
3. Ask questions about the information.
4. Students answer.



Follow-Up

Students ask questions.

Students make as many statements as they can about the chart in 30 seconds.

Options

Put pictures on the chart.

Sample Charts

Cardboard clocks with moveable hands.

Bus schedules.

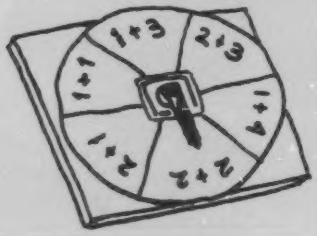
Street maps.

SPINNERS

Students spin the arrow and give the response that the arrow points to on a spinner card.

Procedure

1. Students spin the arrow.
2. Students give the response that the arrow points to.



Two plus two is four.

Options

Responses can be oral, written or actions.

Use more than one spinner to vary responses.

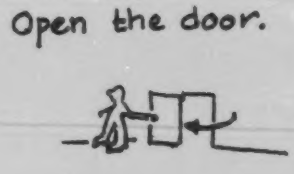
Techniques: Structured Practice

ACTION SEQUENCE

Students perform actions in response to directives or commands.

Procedure

1. Give the directives.
2. Students perform the actions.


Open the door.

Follow-Up

Students give the directives.

Options

Students describe their actions.

Use pictures to cue directives.

RECONSTRUCTION

Students recombine words from a list of sentences to make new sentences.

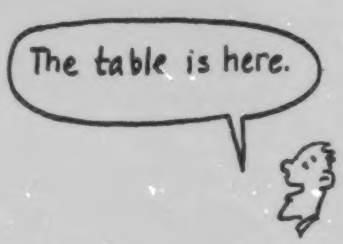
Procedure

1. On the blackboard, put a series of sentences that students already know.
2. Students make new sentences using only the words on the blackboard.
3. Tell the students if their sentences are correct or not

It's on the table.
Give the paper to me.
I am here.

Follow-Up

Students write their sentences on the blackboard.


The table is here.

Options

Students make short dialogues from the sentences.

Techniques: Activity Operations

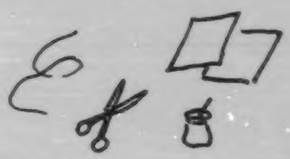
In these techniques, students work with tools and materials to carry out a procedure which usually leads to a specific end result. Some examples are: operating a sewing machine, making coffee or making something out of wood. Students get information (e.g. how a sewing machine works) and learn how to use tools (e.g. a saber saw). They also learn language associated with the activity.

OPERATION

Students carry out an activity, using tools and materials to achieve the end result.

Procedure

1. Present the activity.
2. Distribute the tools and materials.
3. Students carry out the activity.

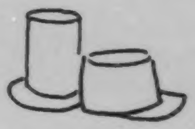


Follow-Up

Students check their work.

Option 1

Show the students the end result. Ask them to achieve the same result, using the tools and materials.



Make a paper hat.

Do not tell them how to do it.

Students check their work.

Techniques: Activity Operations

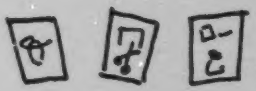
OPERATION

OPTION 2

Demonstrate the steps of the activity.

OPTION 3

Use pictures to show the steps of the activity.



OPTION 4

Present language to describe the steps of the activity.

Take the string.
Measure your head.

The purpose of these techniques is to help students use language to express themselves and to communicate with others.

DIALOGUES

Students memorize phrases and sentences which are part of common, everyday conversations.

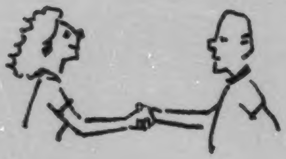
Procedure

1. Present the dialogue.
2. Students memorize the lines.

Follow-Up

In pairs, students perform the dialogue.

Options



Include appropriate non-verbal language (gestures, facial expressions, etc.).

Use puppets or props for the parts of the dialogue.

To help students memorize, write the dialogue on the board and gradually erase words until nothing remains.

CONSTRUCTALOG

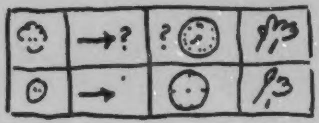
Students make their own dialogues from a list of words and expressions.

Procedure

1. Write the words on the blackboard.
2. In pairs, students create short dialogues.
3. Students perform the dialogues.

Options

Put pictures on the blackboard instead of words.



CUMMINGS DEVICE

From a list on the blackboard, students insert words or phrases into "holes" in a short conversational exchange.

Procedure

1. Present the exchange and the words and phrases.
2. Students practice the exchange and the substitutions.
3. In pairs, students perform exchanges.

- Which bus goes to ___(1)___ ?
+ Number ___(2)___.
- Where's the bus stop?
+ It's ___(3)___.

(1) hospital
bank

(2) 16
17

(3) on the corner
across the street

Follow-Up

Students put the exchange into a longer conversation.

Options

Use pictures or symbols to cue words and phrases.

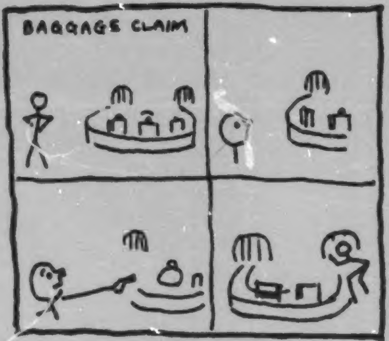
Students provide language items for the "holes."

PICTURE STORY

Students follow a sequence of pictures to tell a story.

Procedure

1. Present the pictures and tell the story.
2. Students re-tell the story.



Follow-Up

Students act out the story in a role play.

Options

Ask students questions about the story.

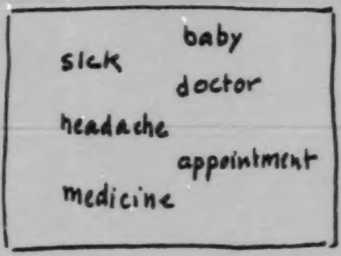
Choose picture stories that have a cultural topic.

SPIEL

Students prepare a short talk which they give to the rest of the class.

Procedure

1. Write a number of key words on the blackboard.
2. Students prepare a 30-second talk using the words.
3. Students give their spiels to the rest of the class.



Follow-Up

Students summarize each others' spiels.

Options

Choose words that are related to a particular topic.

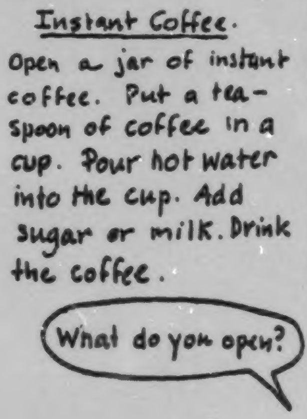
Use pictures instead of key words.

NARRATIVE

Students talk about a short descriptive paragraph on a particular topic.

Procedure

1. Present the narrative.
2. Ask questions about it.
3. Students answer the questions.



Instant Coffee.

Open a jar of instant coffee. Put a teaspoon of coffee in a cup. Pour hot water into the cup. Add sugar or milk. Drink the coffee.

What do you open?

Follow-Up

Students re-tell the narrative.

Options

Use a picture to illustrate the narrative.

RECITATION

Students supply missing information in a series of structured expressions to make statements about themselves.

Procedure

1. Present the recitation with information about yourself.
2. Ask questions about it.
3. Students answer the questions.
4. Students write their own recitations.
5. Students present their recitations.

My name is ____.
I'm from ____.
I'm ____ years old.
I live on ____.

Follow-Up

Make a chart with information from the recitations.

Options

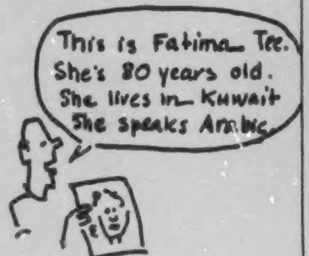
Students ask the questions that will elicit the answers in their recitations.

CHARACTERS

Students create identities for persons in photographs or drawings and present their "characters" to the rest of the class.

Procedure

1. Put biographical categories on the blackboard.
2. Students supply this information about the person in their photo.
3. Students present their characters.


This is Fatima Tee. She's 80 years old. She lives in Kuwait She speaks Arabic.

Follow-Up

Students role play encounters between their characters.

Students return periodically to their characters to add information about them.

Options

Students draw pictures of their characters instead of using photographs.

Techniques: Communication Games

The purpose of these techniques is to provide students with opportunities for spontaneous, natural use of language through games.

TWENTY QUESTIONS

Students ask questions of one person to guess the name of a famous person, an animal or an object.

Procedure

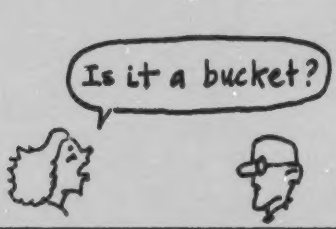
1. Give one student a card with a name on it.
2. Students ask this person questions (only those requiring yes-no answers).
3. Give the name to the students if they have not guessed it after twenty questions.

Options

Students ask only ten questions.

Set a time limit for questions (e.g. three minutes).

Students choose the names.

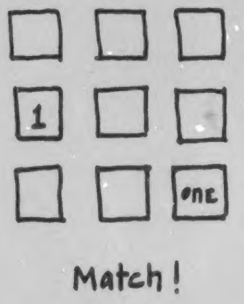

Is it a bucket?

CONCENTRATION

Students compete to match pairs of index cards by remembering their location. The student with the most pairs wins.

Procedure

1. Lay the cards face down in columns and rows.
2. Taking turns, students turn over two cards. If they don't match, students turn them back over.
3. When a match is made, the student removes the cards and takes another turn.



Options

Students say a sentence with the words when they make a match.

Some matches: pictures with words
numbers with words
parts of a sentence

GO FISH

Students play a card game where they ask each other for cards to make pairs. The student who gets the most pairs wins.

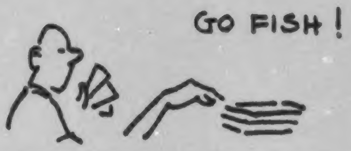
Procedure

1. Prepare a set of matching cards.
2. In small groups, students take turns asking each other for cards to match those they have in their hand.
3. When students don't have the cards, they say, "Go fish!"
4. Students take a card from the pile.
5. Continue until all cards have been matched.

Options

Put pictures on the cards.

Put phrases or sentences on cards.

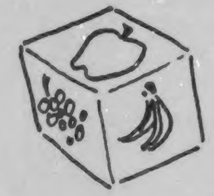


CUBES

Students throw a cube with pictures on its six sides to cue statements or questions.

Procedure

1. Present the information on the cube.
2. Ask questions about the sides.
3. Students answer the questions.
4. Students throw the cube. One asks and another answers about the side.



- What do you want?

+ I want an apple.

Options

Students throw two cubes, each with different information on its sides.

Students form teams to ask and answer the questions.

The purpose of these techniques is to give students an opportunity to get information about the culture, to acquire appropriate behavior and to learn about the values that people of the culture hold. They also allow students to make comparisons with their own culture.

ROLE PLAY

Students take on certain roles and act out specific situations that they might encounter in the culture.

Procedure

1. Present the situation.
2. Assign roles to students.
3. Students role play the situation.

Visit to the Doctor.

Follow-Up

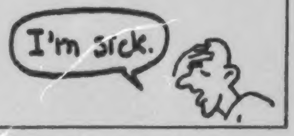
Students comment on the role play.

Students perform the role play again.

Options

Include appropriate non-verbal behavior (gestures, eye contact, facial expressions, etc.).

Record the role play and write a transcript of what was said.



OPEN-ENDED STORY

Students offer endings to an unfinished story which describes a situation they might encounter in the culture. They discuss implications of their endings.

Procedure

1. Present the story.
2. Students create endings.
3. Students give their endings.

While Lee is on a coffee break, one of his co-workers borrows his electric saw. He drops it. At the end of the day, Lee finds the saw is broken. What should he do?

Follow-Up

Discuss implications of the various endings.

Options

Use a sequence of pictures for the story.

Students choose one of four endings.

VALUATION

Students make choices about situations and examine the reasons behind their choices--their values.

Procedure

1. Present the situation.
2. Present the choices.
3. Students choose.
4. Students explain the reasons for their choice.

Follow-Up

Students talk about the sources of their values.

Options

Students compare their choices and their values.

Note

There are no "right" or "wrong" values. The purpose is to allow students to see and compare.

your boss shouts at you for working too slow at your job.
You:
1) work faster.
2) ignore the boss.
3) quit the job.
4) shout at the boss.

DEPICTIONS

Students depict their interpretation of an aspect of the culture by making a drawing or by modelling clay.

Procedure

1. Present the topic.
2. Students create their depictions.
3. Students describe what their creations mean.

Follow-Up

Students compare their depictions.

Options

Students interpret each others' depictions.

your job in the U.S.

PICTURE INTERPRETATION

Students study a photograph of an aspect of life in the culture and they make observations and interpretations about it.

Procedure

1. Present the picture.
2. Students study it.
3. Students make statements about what they see.

Follow-Up

Students compare the aspect with their own culture.

Options

Use slides or video-tapes.

Students bring pictures from their culture and interpret them.

SIMULATION

Set up an environment in class which approximates a situation in the culture. Students play certain roles and carry out prescribed tasks in the simulated environment.

Procedure

1. Give the students roles and tasks.
2. Prepare the setting, the props and materials.
3. Students carry out their tasks.

- Restaurant -
Waiter
Customer
Manager
Cashier

Follow-Up

Students discuss their observations and reactions.

Options

Use authentic props and materials.

Include roles or tasks which cause conflicts or unexpected situations.

Techniques: Cultural Exploration

SONGS

Students learn the words and melodies of songs of the culture and sing them in class.

Procedure

1. Present the song.
2. Students memorize and sing it.

Follow-Up

Present/Elicit information about the culture that is in the lyrics.

Options

Choose songs which feature certain topics.

PROVERBS

Students memorize and interpret proverbs to learn about aspects of the culture.

Procedure

1. Present the proverb.
2. Students memorize it.
3. Students analyze the meaning of the proverb.

Time Is Money.

Follow-Up

Students give proverbs on the same topic from their culture.

Options

Students create dialogues in which they use the proverbs in an appropriate way.

The purpose of these techniques is to help the students master pronunciation.

MINIMAL PAIRS

Students recognize a difference of one sound in two words and pronounce each word correctly.

Procedure

1. Put a list of minimal pairs in a column on the blackboard.
2. Read the words.
3. Students indicate the words they hear.
4. Point to words.
5. Students say them.

pick	peck
did	dead
sit	set
knit	net

Options

Use pictures instead of words.

Number the columns so that students can indicate the sound by saying "one" or "two."

Say two words (sometimes the same word twice, sometimes the minimal pair). Students must say "same" or "different."

ORAL CUES

Students associate pronunciation with noises and other sounds and use these to work on stress, intonation and phrasing.

Procedure

1. Say the sentence.
2. Give the oral cues.
3. Students say the sentence.
4. Repeat oral cues to help them correct errors.

Where are you going?

DAH-dah-dah-DAH-dah?

Options

Hum or tap on the blackboard instead.

VISUAL CUES

Students associate pronunciation with marks on the blackboard and use these to work on stress, intonation and phrasing.

Procedure

1. Say the sentence.
2. Put cues on the blackboard.
3. Students say the sentence.
4. Point to marks to help them correct errors.

What are you doing?

—— – – ——

Options

Write the sentence on the blackboard and put marks above the words.

Use the fingers of your hand to represent words and show stress, intonation and phrasing by gestures with the other hand.

Show formation of individual sounds by mouthing them in an exaggerated manner.

SOUND CONTRAST

Students say words that have the same sounds as two words with certain specified sounds.

Procedure

wind tell

1. Put two key words on the blackboard and underline a sound in each one.
2. Students say words that have these sounds.
3. Write the words under the word they indicate.
4. Students decide if the words are in the correct column.

Options

Put the words on index cards for students to group according to similar sounds.

Use stress and intonation patterns.

• /   / •

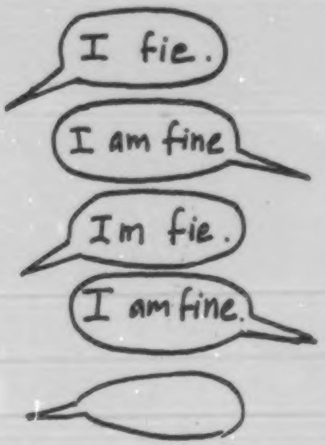
hello   morning

DIRECTED REPETITION

Students work on pronunciation by directing the teacher to repeat what they say.

Procedure

1. Individually, students say sentences or words.
2. Repeat what they say.
3. Stop repeating when the student stops.


I fie.
I am fine
Im fie.
I am fine.

Options

Put a list of words or sentences on the blackboard. Students use these for the exercise.

Limit the amount of time for each student to have you repeat.

Note

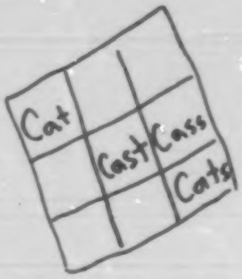
It is the student who is directing your repetition. It is important to repeat what they say in correct form, but do not point out errors to the student.

MINIMAL SETS

Students recognize the difference of one sound in a set of words and pronounce each word correctly.

Procedure

1. Draw a picture to accompany each word.
2. Put each word on a separate card.
3. Say each word while showing the card.
4. Point to the words.
5. Students say them.



Options

Students play Tic Tac Toe by placing the cards in a pocket chart or slot board.

Techniques: Literacy

The purpose of these techniques is to help students master basic reading and writing.

COPYING

Students write what they see.

Procedure

1. Write a list of words on the blackboard.
2. Students copy the words on paper.

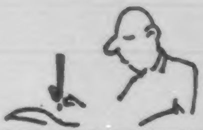
Follow-Up

Students check their work.

Options

Students copy numbers, letters of the alphabet or sentences.

Students copy from printed material.



DICTATION

Students write what they hear.

Procedure

1. Read aloud a list of words, pausing after each one.
2. Students write each word.

Follow-Up

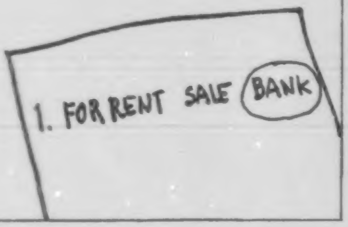
Students check their work.

Options

Read numbers, letters of the alphabet or numbers.

Students read aloud what they wrote.

Students circle words on a prepared handout.

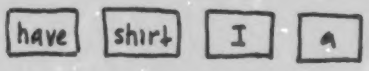


SCRAMBLES

Students arrange index cards labelled with words in a sequence to make sentences.

Procedure

1. Prepare sets of scrambles on index cards or strips of paper.
2. Students re-arrange the cards to make sentences.



Follow-Up

Students exchange sets of scrambles.

Students copy the unscrambled sentences.

Options

Students re-arrange letters to make words.

Students re-arrange sentences to make paragraphs.

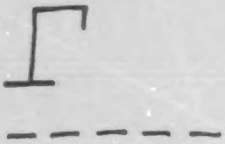
Students make their own scrambles.

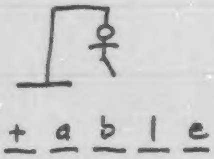
HANGMAN

Students say letters to spell words they don't know. For every wrong guess, the student who knows the word draws a part of a stick figure on a "scaffold." If the students make too many wrong guesses, the stick person is "hanged."

Procedure

1. Put the scaffold on the blackboard. Put a row of lines for each letter of the word.
2. Students say letters.
3. Write correct guesses on the lines.
4. For each wrong guess, draw a part of the stick person.





Options

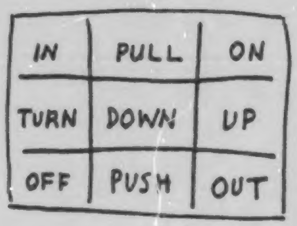
Students copy the words.

TIC TAC TOE

Students compete to put three markers in a row on a grid with words in the squares.

Procedure

1. In pairs, students read aloud the word in the square where they want to put their marker.
2. Students put their marker in that square.
3. The first student to get three in a row wins.



IN	PULL	ON
TURN	DOWN	UP
OFF	PUSH	OUT

Options

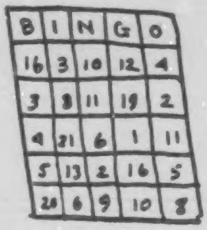
Instead of saying the words, students find the matching word from a set of flashcards.

BINGO

Students compete to put markers in a row on a Bingo Card--a grid with numbers and the letters B, I, N, G and O.

Procedure

1. Distribute Bingo Cards and markers to students.
2. From a master list, read aloud letter-number combinations at random.
3. Students put markers on the squares with the appropriate combinations.
4. The first student to put the markers in a row says "Bingo!" and wins.



B	I	N	G	O
16	3	10	12	4
3	8	11	19	2
4	21	6	1	11
5	13	2	16	5
20	6	9	10	8

Follow-Up

Check the winner's combinations.

Options

Put pictures or words in the squares.

The purpose of these techniques is to help you see what your students know, what they have learned and what they need to learn.

PICTURE DESCRIPTION

Students say as much as they can about a picture.

Procedure

1. Post the picture.
2. Students make statements about the picture.
3. Make notes of students' ability.

Follow-Up

Repeat the exercise periodically to judge students' progress.

Options

Use pictures that feature particular topic areas.

Students write descriptions.

OPEN-ENDED TASK

Students do or say as much as they can in a specified task (a role play or construction project).

Procedure

1. Set the task.
2. Students do the task.
3. Make notes on their work.

Tell me what you see in the room.

Follow-Up

Repeat the task periodically to judge students' progress.

Options

Give students a topic and have them talk about it for two minutes.

For construction tasks, students talk about their actions.

Techniques: Assessment

INTERVIEW

Students respond to a series of questions.

Procedure

1. Prepare a list of questions.
2. Interview individual students.
3. Make notes on their ability.

Follow-Up

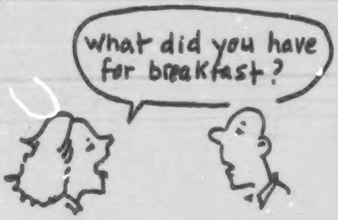
Interview students regularly to judge progress.

Options

Record the interviews and have students listen to them.

Prepare questions that elicit particular grammar points and vocabulary.

Use pictures.


What did you have for breakfast?

FEEDBACK

Students assess their own learning.

Procedure

1. Ask students to make statements about their own learning.
2. Students reflect and respond.

What did you learn today?

Follow-Up

Ask students for feedback on a regular basis.

Options

Use a translator.

Ask students to describe their strategies for learning.

Ask students to evaluate your teaching.

Note

Ask for feedback only if you are ready to hear it.

MATCHING

Students match symbols or pictures with words.

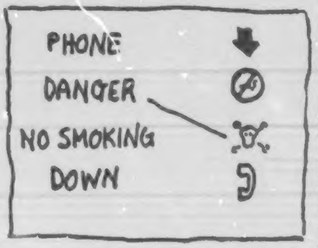
Procedure

1. Prepare a handout with pictures in one column and words in another.
2. Students draw lines to match pictures with the appropriate words.
3. Check students' work.

Options

Students match

- words with their meanings.
- beginnings and ends of sentences.
- questions and answers.



CLOZE

Students write the proper words in the blank spaces in a written passage.

Procedure

1. Prepare a handout of a paragraph with every fifth word missing.
2. Students read the paragraph and write in the missing words.
3. Check students' work.

Options

Use dialogues with missing words.

The drugstore is on ___ corner. I go there ___ buy many things. I ___ a prescription from a _____ to buy medicine.

SKITS

Students show what they have learned by working together to create characters and a scenario for a skit, which they perform in class.

Procedure

1. Set the task.
2. Students prepare their skits.
3. Students perform them.
4. Make notes on their work.

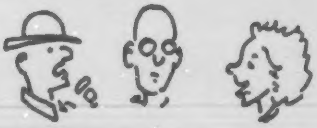
Follow-Up

Students comment on the skits.

Options

Students prepare skits in small groups.

Specify topics or areas that students must incorporate in their skits.

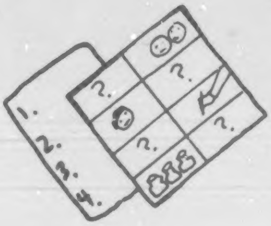


DYADS

Students ask questions to fill in the blank spaces on a written sheet.

Procedure

1. Prepare two diagrams and two question sheets.
2. Each pair of students has the same diagram but different items of information are missing.
3. Students work in pairs to fill in the missing information by asking questions.



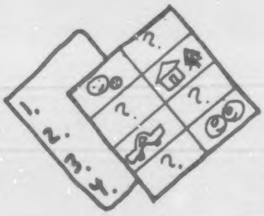
Follow-up

Ask each pair of students to compare their diagrams.

Options

Use pictures or symbols.

Prepare dyad diagrams of streets, schedules, store aisles, cabinets, shelves, refrigerators, etc.



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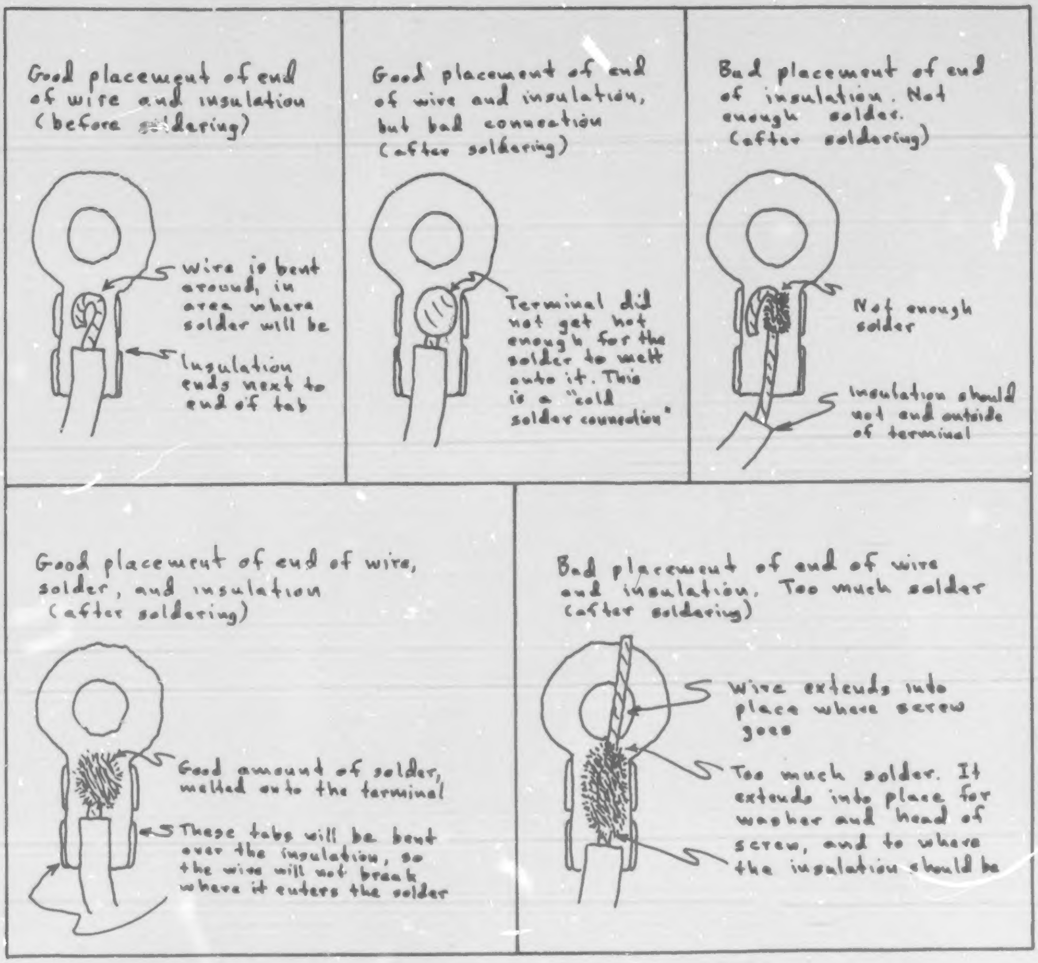
ELECTRICITY: TECHNICAL NOTES

Soldering A Terminal:

Put all the necessary tools and materials on the table. Plug in the soldering iron and put it on the soldering iron holder. Bend the ends of your tinned wires so that they will fit correctly into the terminal (see illustration). Put a little flux on the terminal where you are going to attach the wire. Melt a little solder onto the tip of the soldering iron. Heat up the terminal by touching the soldering iron and melted solder on it. After the solder has melted onto the terminal, take the soldering iron away and lay the tinned wire on the solder. Then touch the soldering iron to the wire and bring it, the melted solder, and the terminal all up to the same temperature. If necessary add a bit more solder. Remove the soldering iron. Hold the wire against the terminal until it cools. If you move the wire the soldered connection will not be strong or conduct electricity well. Solder a number of terminals and compare your results to the terminals in the illustration.


Good placement of end of wire and insulation (before soldering)
wire is bent around, in area where solder will be
Insulation ends next to end of tab
Good placement of end of wire and insulation, but bad connection (after soldering)
Terminal did not get hot enough for the solder to melt onto it. This is a "cold solder connection"
Bad placement of end of insulation. Not enough solder. (after soldering)
Not enough solder
insulation should not end outside of terminal
Good placement of end of wire, solder, and insulation (after soldering)
Good amount of solder, melted onto the terminal
These tabs will be bent over the insulation, so the wire will not break where it enters the solder
Bad placement of end of wire and insulation. Too much solder (after soldering)
Wire extends into place where screw goes
Too much solder. It extends into place for washer and head of screw, and to where the insulation should be

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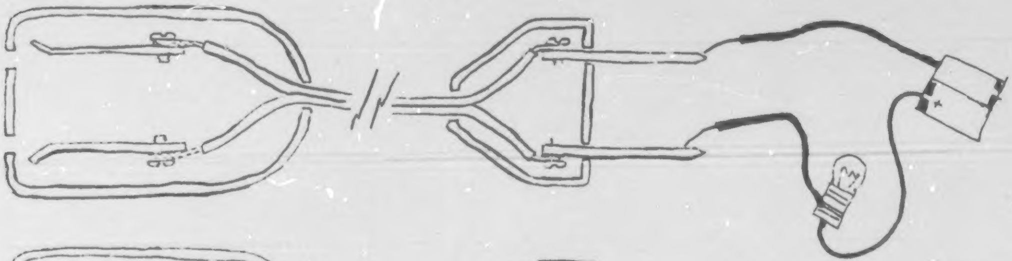
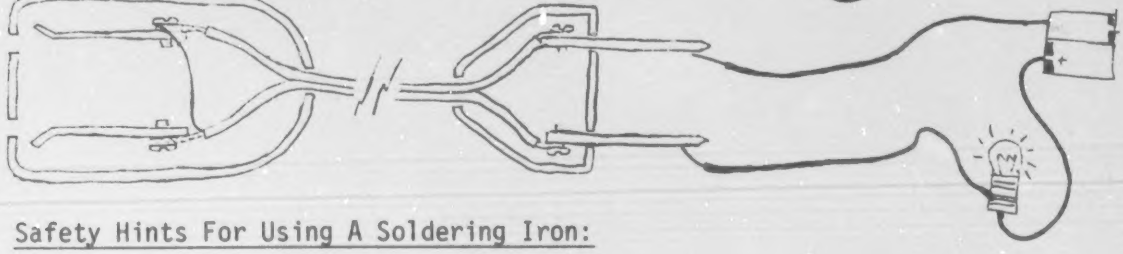
Demonstrating A Short Circuit:

Show students how dangerous electricity can be and how to recognize an improperly wired plug or socket. Take apart the socket of an extension cord. Use a test light, as shown in illustration 1, to demonstrate that the socket is properly wired when the bulb does not light up. Now take a single strand of lampcord from one of the terminals and attach it to the other terminal as shown in illustration 2. (This can actually happen by mistake when a socket is not carefully wired). Use the test light again and the bulb will light up, indicating a bad connection. Put the socket on the table or floor; have everyone stand back to observe, and plug in the extension. You will see a small bright flame for a very short time and hear a "pop" while the strand of wire burns up. (Before doing this, it is a good idea to know where the fuse box is in case a fuse blows and then needs to be replaced). Any connection that can cause damage, such as the one just demonstrated, is called a "short circuit."





Safety Hints For Using A Soldering Iron:

The most important safety issue is to make sure no one gets seriously burned by a soldering iron. Place the cords to prevent tripping over them and pulling a hot soldering iron off the table. It might fall on someone's leg and cause a burn. Tying the cord of each soldering iron to the leg of a table is helpful if cords have to be put where people walk. If there is an electric outlet in the ceiling over the table, you can have an extension cord hang from it, and connect several soldering irons there.

Soldering is a relatively safe process. The solder and flux do not tend to splatter. However, it is very important to wear safety glasses when you are unsoldering things. When you pull pieces of wire out of a terminal that has hot solder on it, tiny balls of hot solder can get in your eyes. If you take old equipment apart, be careful of this.

Appendix: 1

SPECIFICATIONS FOR ELECTRICAL MATERIALS

Where To Buy Materials:

The tools and materials needed for the electrical lessons can be found at most electronic hobby supply stores. Get a catalog (for example from Lafayette or Radio Shack) and look through it to see which materials will best suit your needs, or consult store employees. Other places to find materials are auto supply stores (especially for terminals) and hardware stores (especially for soldering supplies).

Flux:

The purpose of flux is to clean metal, so solder will melt onto it when the metal is heated to form a strong connection after it has cooled. Solder made for wires is not solid, but is actually a tube filled with flux. Sometimes, however, this amount of flux is not enough, and you have to put a little flux on the wire or terminal you are trying to solder. This type of flux (which works well with copper) is often called "rosin flux." If you want to solder onto iron (e.g. to a nail) you must use a different kind of flux, usually called "acid flux." If flux contains "zinc chloride," it is acid flux. You can find this at hardware stores and plumbing supply stores.

Switches:

Like all electrical materials, switches come in many varieties. For lessons involving batteries and circuits, pick switches that are not too small and that use screw terminals for attaching the wires. Use a few "knife" switches to help students understand how a switch actually works, because all of the moving parts are visible and students can see how the circuit is connected (turned on) and disconnected (turned off) by the switch. For making lamps, use only switches that are for household current.

Terminals:

Other names for terminals include "lugs" and "tongues." It is important to buy terminals which require soldering. (Many terminals used nowadays are solderless and only require crimping the terminal around the wire to make the connection). Pick terminals that have a ring on the end that does not get soldered so that they can be firmly attached to the circuit board by putting a small screw through that ring. Terminals come in different sizes. Pick ones which are large enough to work with easily.

Wire:

These lessons use two different kinds of wire: lampcord and bell wire. Lampcord is used on most home appliances (e.g. lamps, electric clocks, blenders) and is actually two separately insulated wires that are held together side by side with the plastic insulation. Bell wire is a single insulated wire. Both wires are made of many fine strands of copper. Wire comes in different thicknesses called "gauges." The higher the gauge number the thinner the wire. In general, lampcord is gauge #18. For the purposes of these lessons, buy the thinnest gauge of bell wire that is still multi-strand wire, which is probably gauge #22. Bell wire is also called "connection wire," "hook up wire," and "test probe wire." Be sure to buy wire that has insulation that can be easily stripped.

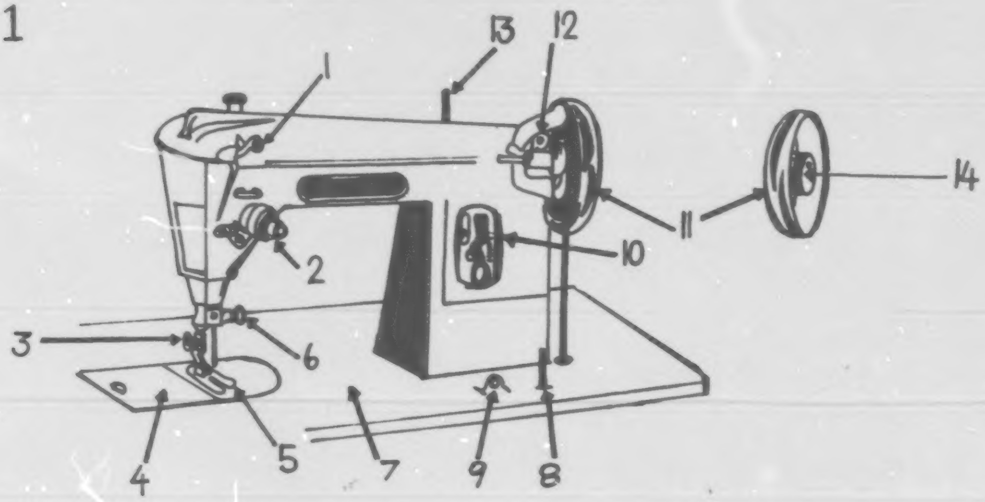
Appendix: 2

SEWING: TECHNICAL NOTES

Operating An Electric Sewing Machine:

All sewing machines operate on the same principles. However, there are mechnical differences between models. To learn how to operate your machine read the owner's manual or talk to someone who knows about sewing machines. Sewing and fabric stores usually have instruction books or employees who can answer questions or give demonstrations. Sometimes there are classes on how to use a sewing machine.

1



1. Thread take-up lever
2. Tension regulator
3. Presser foot tightening screw
4. Shuttle cover plate
5. Presser foot
6. Needle clamp
7. Bed-plate
8. Bed spool pin
9. Tension bracket
10. Stitch regulator lever
11. Hand wheel
12. Bobbin winder
13. Spool pin
14. Stop-motion screw

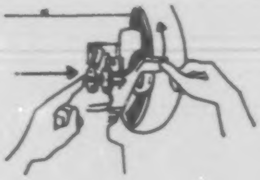
Getting To Know The Machine:

Illustration 1 shows the names of the important parts of a sewing machine. Compare the diagram to your machine and identify the parts and their functions. Practice "sewing" without any thread or cloth. (If you sew with thread but without cloth the thread will tangle and jam the machine, and you will have to remove the bobbin to remove the knotted threads). To make the machine operate with a smooth and steady rhythm, control the pressure you put on the pedal. Put your hand on the hand wheel when starting and stopping for complete control of the machine. You may have to help the machine start by gently turning the hand wheel towards you, especially when sewing thicker fabrics. But never force the wheel; you can damage the machine.

Winding The Bobbin:

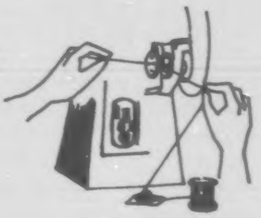
1. Loosen the stop-motion screw on the hand wheel and put the bobbin on the bobbin winder (see illustration 2.1).

2.1



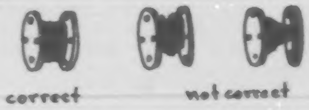
2. Press the bobbin winder against the hand wheel.
3. Put a spool of thread on the bed spool pin, lead the thread around the tension bracket, and thread it through the hole in the left side of the bobbin (see illustration 2.2).

2.2



4. Hold onto the end of the thread, start the machine, and the thread will wind around the bobbin. Be sure the bobbin is wound smoothly and with an even amount of tension, or it will not unwind properly while sewing (see illustration 2.3).

2.3

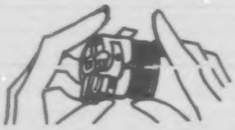


5. Remove the bobbin, return the bobbin winder to its normal position and tighten the stop-motion screw.

Threading The Bobbin:

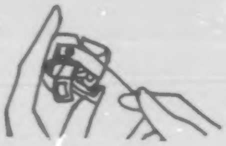
1. Remove the bobbin case. Depending on the machine, find the bobbin case either by raising the table extension or by sliding the shuttle cover plate open.
2. Hold the bobbin case in one hand and use the other hand to put the already threaded bobbin into it (See illustration 3.1).

3.1



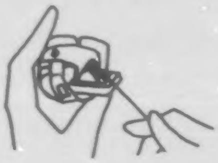
3. There is a slot on the edge of the bobbin case. Guide the thread into the slot (see illustration 3.2).

3.2



4. Now pull the thread under the tension spring and into a small hole called the delivery eye (see illustration 3.3). Put the bobbin and bobbin case back into the machine.

3.3

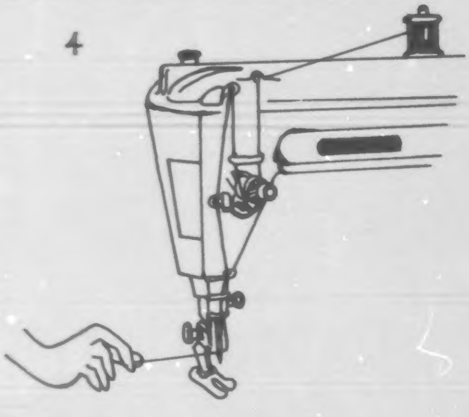


Appendix: 2

Threading The Upper Part Of The Machine:

Raise the take up lever and the needle to their highest positions by turning the hand wheel towards you. Put the spool of thread on the spool pin and thread the machine as shown in illustration 4. It is important to pass the thread through the needle in one specific direction, depending upon your machine (for example, from left to right and not from right to left). Pull 10-20 centimeters of thread through the needle.

4



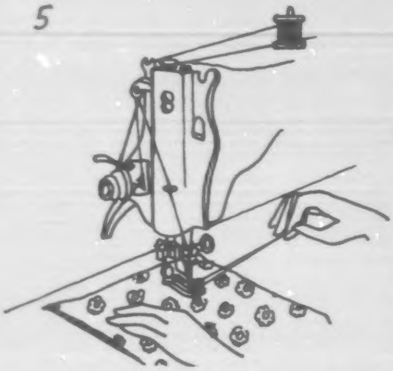
"Catching" The Bobbin Thread:

Some machines "catch" the bobbin thread automatically once you start sewing. For others you have to hold on to the end of the thread coming from the needle, turn the hand wheel manually to "catch" the bobbin thread and then pull out 10-20 centimeters of bobbin thread. Gently pull both the bobbin and needle threads tight and lay them out straight on the bed plate.

Starting To Sew:

Before inserting the cloth, make sure the needle is in its highest position and the presser foot is raised. After the cloth is in position, lower the presser foot, and you are ready to sew. A common problem is not pulling out enough thread. Then, the needle becomes unthreaded when you start sewing. To avoid this, hold on to the ends of the thread as you start the machine (see illustration 5).

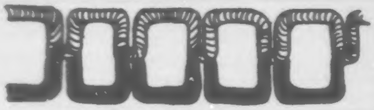
5



Adjusting The Tension:

Adjust the tension properly for the kind of fabric you are sewing. If not correctly adjusted, the fabric may pucker, or loops of thread may appear on one or both sides of the cloth (see illustration 6). When the tension is correctly adjusted, the stitching on both sides of the cloth is tight and looks the same. There are two ways to adjust the tension. The tension regulator controls the tension of the thread that goes through the needle, and there is a tension adjustment screw by the bobbin case which controls the tension of the bobbin thread. Tension adjustments are difficult, so read the manual or have someone demonstrate.

6



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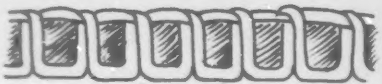


not correct

Regulating The Stitch:

The stitch regulator is used to adjust the number of stitches per inch. Also, by lifting up the stitch regulator lever you can reverse the direction that the machine sews.

Sewing Tips:

When sewing, do not force the material through the machine. Allow the cloth to be pulled through by the feed teeth, gently guiding it to keep the stitching going in the desired direction.

To sew a corner, stop the machine where you want to make the turn. Make sure the needle remains through the cloth, and raise the presser foot. Now turn the cloth by pivoting it around the needle, lower the presser foot and start sewing again.

When you come to the end of a seam, reverse direction by raising the stitch regulator lever and sew backwards over the stitching a few centimeters to "lock" the stitches and keep them from unraveling.

When you want to remove the fabric, make sure the needle is in its highest position, raise the presser foot, and pull the cloth out slowly. Cut the threads that come from both the bobbin and the needle close to the cloth, and remove the cloth. Be sure to leave enough thread coming out of the needle so the sewing machine does not become unthreaded.

It is important to lubricate a sewing machine with spcial high grade oil (read the manual to locate the points of lubrication).

General Safety Hints:

1. Have adequate lighting so you can see what you are doing.
2. Pay attention to your work when operating the machine.
3. Keep the sewing machine and the work area around it cleared. Learn to put scissors, pins, etc. to the side so they do not get jammed into the machine.
4. When turning the hand wheel use the palm of your hand to be sure you don't get your fingers caught in the wheel or between the wheel and the belt.
5. Always keep fingers to the right and left of the needle, and not behind or in front of it.

Appendix: 2

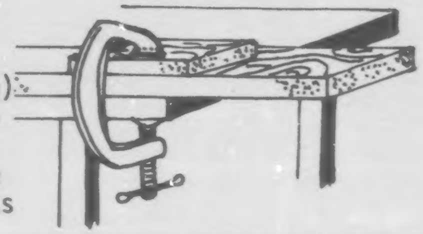
TROUBLE-SHOOTING SEWING MACHINES

Problem	Possible Reasons
The sewing needle breaks:	- The tension regulator is adjusted too high. - The fabric is too thick for the needle being used. - The needle is improperly inserted or bent. - The material is pulled too fast while sewing. - The presser foot is crooked or not tight enough.
The needle thread breaks:	- The upper part of the machine is not threaded properly. - The tension regulator is adjusted too high. - The take-up lever is not in its highest point before starting to sew.
The bobbin thread breaks:	- The threads are jammed in the bobbin case. - The bobbin is wound too tightly or has too much thread in it. - The bobbin and bobbin case are not inserted correctly.
Nothing moves when you start the machine:	- The threads are jammed in the machine. - The stop-motion screw needs to be tightened. - The belt from the motor is too tight or too loose.
Material does not feed correctly through the machine:	- The presser foot needs adjustment (see manual).
The stitching is not correct:	- The tension needs adjustment (see manual).
The stitches are loose on the top side of material:	- The tension regulator needs to be increased.
The stitches are loose on the bottom side of material:	- The tension regulator needs to be decreased.

WOODWORKING: TECHNICAL NOTES

Using a "C" Clamp :

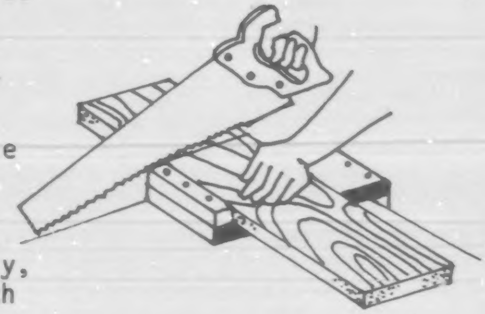
When sawing, drilling, or screwing pieces of wood together, use a "C" clamp to insure a safer activity and a better result. You can clamp one piece of wood to a table (for sawing) or 2 pieces to a table (for drilling or screwing them together). When clamping, use a small wood block between the clamp jaw and the piece of wood you are working on to avoid dents in your project.



Using a Bench Hook :

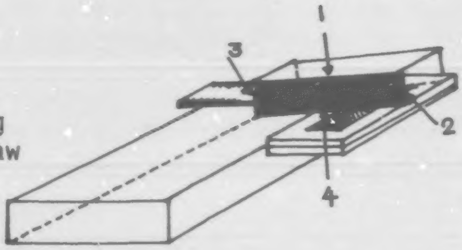
A bench hook is similar to a "C" clamp. It is particularly useful when a woodworking task requires one hand and leaves the other hand free to hold the project or when a piece of wood only needs to be held firmly for a short period of time and then held again in a different position (e.g. sanding).

Put the first "hook" on the edge of the table and push the piece of wood being worked on firmly against the second "hook". Now use the other hand to do the task (e.g. sawing). If you cannot hold the piece of wood securely, then you will need to use a "C" clamp. Bench hooks also can be used to protect the table for such tasks as drilling, or soldering.



Using a Saw:

When learning to saw, a good practice is to draw pencil lines on all 4 sides of the piece of wood where you want to make the cut. Using a square, draw line 1 on a flat side, then draw lines 2 and 3 on the edges, and finally draw line 4 connecting the ends of line 2 and 3. Take your time and do it accurately. Use the square again to make sure all of the lines are perpendicular to the edges of the wood. If not, do it again.



Clamp the board and cut. Stop occasionally to make sure you are still on the lines on the other three sides. If not, stop, back up, and correct the cut. When you can cut with proficiency and keep the saw perpendicular to the surface of the

Using a Saw (cont'd):

wood, line 4 will no longer be necessary, but lines 2 and 3 are always a good idea.

To begin a cut, start with the end of the blade closest to the saw handle against the wood. Pull up. You may have to repeat a few times until the cut is deep enough so that the saw will not jump out of the groove when you push down. Use a firm stroke, cutting mostly on the push stroke.

Using a Drill:

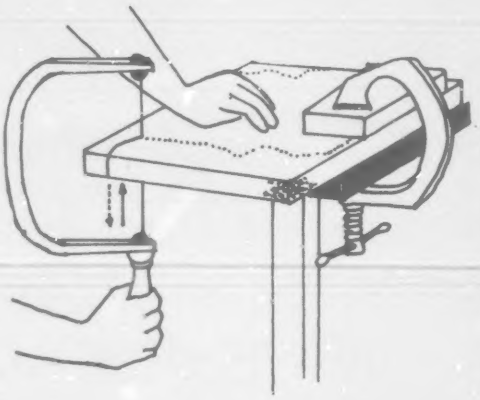
When using a hand drill, make sure the drill bit is perpendicular to the surface of the piece of wood. Begin drilling, but keep the drill straight. You may tend to lean to one side. Ask somebody to watch you, if it is hard for you to correct this problem. Drill bits break, especially smaller ones, when they get overheated or if the whole drill is wiggled sideways while drilling. If the bit jams, back it out by pulling the bit forward slowly while continuing to drill. Then drill again. If many holes of the same depth are needed, wrap a piece of tape around the bit to mark how deep into the wood the bit should go.

Using a Screwdriver:

Choose the screwdriver that best fits the head of the screw. (For this curriculum small and medium screwdrivers should be sufficient.) Start the screw with your fingers. Hold the screwdriver with both hands--one on the shaft to steady it and one on the handle to turn. Make sure the screwdriver stays in line with the screw. If not, you may strip the head of the screw, and you will have to back it out and start again with a new screw. Put a little bit of moist bar soap on the threads to reduce friction between the screw and the wood to make turning the screwdriver easier. If turning the screwdriver is very difficult even with soap, then your hole is too small. Drill a larger one. If the hole is too large the screw will go in too easily and not hold the pieces of wood together very well.

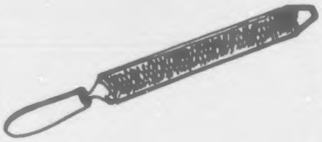
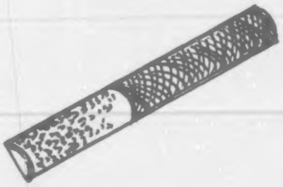
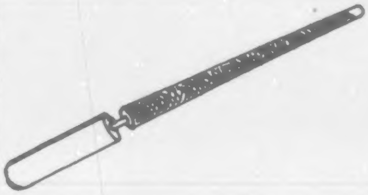
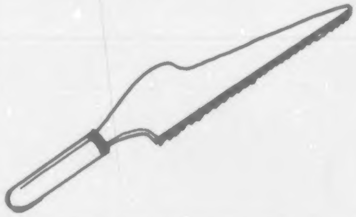
Using a Coping Saw:

Install the blade so that the saw cuts on the pull stroke. Clamp the piece of wood to a table. Depending on the design, you may have to stop and re-clamp the wood in different places so that you can maneuver the coping saw. Cut by pulling down, and not when pushing up. Do not force the saw or the blade. Coping saw blades are very fragile and bend easily. Once they are bent they no longer work well and must be replaced. You may want to kneel on the floor when cutting to make sure the action of the saw going up and down is straight and perpendicular to the surface of the wood. Coping saw blades come in different gauges--from coarse to fine teeth. For projects with intricate curves use finer blades, however, finer blades also bend and break more easily.



Using Rasps and Files:

There are different kinds of rasps and files. (Rasps are more specific to wood working. Files, although frequently used on wood, are more generally used on metal.) The following are some examples of commonly used rasps and files. If a variety are provided students can experiment with techniques and find out which work best for certain tasks:

Flat wood rasp/ file		- flat on both sides - one side coarser than the other - good for edges and corners
Shoe rasp or "bastard" rasp		- one side is flat; one side round - each side half coarse and half fine - good for edges, corners, and inside curves
"Rat tail" or round rasp/file		- round, comes in different sizes and different degrees of coarseness - good for holes and inside curves
"Sure-form" type rasp (with replaceable blade)		- good for general shaping and smoothing of soft wood; good for plastic, masonite, etc.

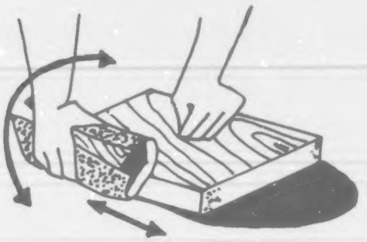
Appendix: 3

Sanding:

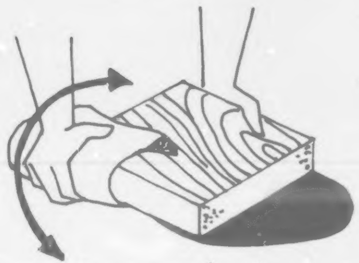
Sanding is simple task, but if you take your time and use a few of the techniques below, you will have a nicer finished product. Sandpaper comes in different grades, from coarse to fine. Begin sanding with a coarse paper (if necessary) and change to a medium grit and finally to a fine grit as needed. There are many varieties of sandpaper; two of the most common are flint and garnet. Flint is cheaper but wears out more quickly than garnet. Either is all right for this curriculum.

You do not have to use a whole sheet of sandpaper at a time. Tear it into smaller pieces (e.g., into thirds or quarters) by folding it back and forth a few times then laying a straight edge along the fold and gently tearing. Do not use scissors to cut sandpaper since it will dull the blades.

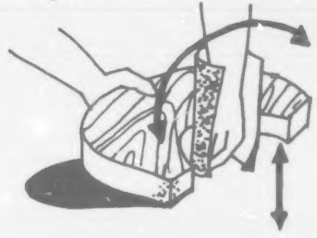
Always sand with the grain, expect on the ends. Be careful not to chip the edges when sanding the ends. The following are some suggestions:



Use sandpaper with a sanding block for smooth surfaces, square edges, and corners

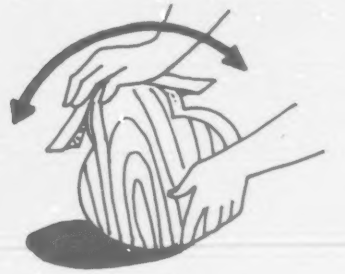


Bend a strip of sandpaper over to sand corners

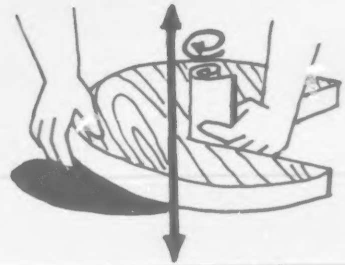


Bend a piece of sandpaper to fit and sand the inside of a curve or corner

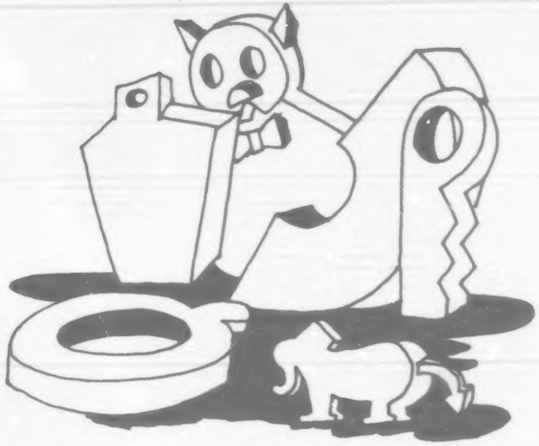
Sanding (cont'd):



Bend sandpaper to fit and sand an outside curve



Roll up a piece of sandpaper to sand the inside of small curve



Other Suggestions:

- Wrap a piece of sandpaper around your fingers.
- Put a piece of sandpaper into the palm of your hand.
- Secure the wood with a clamp. Hold the ends of a piece of sandpaper and pull back and forth.

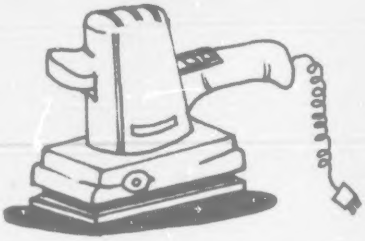
Using an Electric Drill:

The same advice for using a hand drill also applies to using an electric drill. Most electric drills are reversible; therefore, when a drill bit jams, stop the drill, switch it into reverse, and back the bit out. Drill again.

Demonstrate safety procedures. Emphasize that the cord and a person's long hair (which should always be tied back when working with tools) must be prevented from winding around the rotating parts. Also demonstrate how to use the chuck, which has a "key" to loosen and tighten it. Use safety glasses, especially when drilling masonite, plastic or metal. (For more information, on all electric tools, read the operator's manual that comes with each tool.)

Appendix: 3

Using an Orbital or Oscillating Sander:



If available, use an orbital/oscillating sander. Demonstrate its pros and cons; for example, it is good for smooth surface sanding, not so good for edges or curves though usable, and impossible to use for inside corners and curves. Demonstrate care in using this tool. (For example, if it falls off the table it may get seriously damaged. Other than keeping it away from very wet environments there are no specific safety procedures.) Show how to change and fit sandpaper to it, and how to recognize sandpaper that is worn out. Using sandpaper on an orbital/oscillating sander too long can make a hole in the sandpaper and damage the pad.

SPECIFICATIONS FOR WOODWORKING MATERIALS

In preparing this handbook there was much discussion about which measurement system to use--metric or English. In the end we decided on the metric system, because it uses a base 10 principle and seems easier for people who have little or no experience with a standardized measurement system. It also helps in learning the number system and U.S. monetary system.

Working with building and hardware materials raises problems, because they follow the English system--inches and feet. You need to use this system in the U.S., especially when buying wood and screws.

For lumber there is another problem. The name of a piece of lumber is not usually its exact size; for example, a 2x4 (two by four) is not really 2" x 4". In fact, a 2x4 measures 1½"x3½". Pieces of plywood, most moldings and trim pieces or specialty woods tend to be their exact sizes.

Lumber is usually sold in multiples of 2 foot lengths. Commonly available sizes run from 6-16 feet and most stores will cut down larger stock for you if the size you need is not available. Pick lumber carefully to avoid knots, cracks and warps that can frustrate the wood worker or ruin a project.

If your students can add and subtract confidently they may be able to change to inches and feet and learn about the U.S. system of building materials.

Below is a list of standard U.S. lumber and screw sizes that can be used with this handbook:

Lumber:

What you ask for	Actual size in inches	Actual size in centimeters
1 x 1	3/4" x 3/4"	2 x 2 cm.
1 x 2	3/4" x 1½"	2 x 4 cm.
1 x 3	3/4" x 2½"	2 x 6.5 cm.
1 x 4	3/4" x 3½"	2 x 9 cm.
1 x 6	3/4" x 5½"	2 x 14 cm.
1 x 8	3/4" x 7¼"	2 x 18.5 cm.
1 x 10	3/4" x 9¼"	2 x 23.5 cm.

Appendix: 3

Screws: (Flathead wood screws)

Metric Length	U.S. Length
3 cm.	1¼"
4 cm.	1½"
5 cm.	2"

A specific length of screw also comes in thin and thick sizes, or "gauges." For this handbook a gauge of #6 or #8 is sufficient. Pick the gauge that best suits your needs. For screws, the larger the gauge number the thicker the screw. Door hinges or locks that are loose because the hole in the wood has become too big for the screw can be repaired by putting in a screw of a bigger gauge.

GETTING THE MOST OUT OF YOUR BUDGET: GENERAL HINTS

There are many ways that you can get tools, materials or helpful information, which can save you time and money. The following are some suggestions:

1. Under state laws, you may qualify for tax-free status. You can then purchase tools and materials without paying sales tax.
2. Most hardware stores, lumber yards, electrical supply stores, and art materials supply stores give credit and discounts. Your school may already have credit accounts with local stores. Usually it is relatively easy to get a discount if you tell the store manager that you are buying for educational purposes, that you are buying in bulk and that you will continue to buy from that store. Do research first to be sure a store has what you will need (for example, the larger building-supply hardware stores offer more products at better prices than small hardware stores). Find a few reliable places that can supply most of your needs.
3. If you are using school facilities, make friends with custodians and shop teachers. They may be able to help you with technical information and tell you where to get tools and materials. Custodians often have storage rooms full of used materials (such as lumber, hardware, electrical parts, etc.) and they may loan or donate items to your class.
4. Workers in the various stores where you buy your tools and materials usually have a lot of information about their particular technology and stock. If you ask, they are usually eager to assist.
5. Book stores and public libraries usually have hobby and craft sections. There are technical manuals (both on how things work and how to master skills), project-design books and magazines. From these books, you can get technical information and ideas for additional projects. You can show students these books to help them generate ideas of their own or to broaden their understanding of the relevance and logical extensions of the basic skills they are learning.
6. To buy tools and materials cheaply, go to garage sales, church rummage sales and junk stores.
7. If your money is limited, it may be worthwhile to ask for donations.

Appendix: 4

BUYING TOOLS

Hand Tools:

Your budget and the number of times you plan to teach the lessons will affect the quantity and quality of tools you buy. In any case, it is a mistake to buy the cheapest tools available. They are made of inferior materials; they wear out quickly; they are not well calibrated, and they do not perform well the tasks for which they are designed. Beware of special "bargain" sales. Any tool that stops working after a short time is not a bargain. It is better to buy medium-quality brand name products from a store you trust. Make sure students take proper care of tools to make them last longer. For example, don't put wood saws on metal or concrete, don't use screwdrivers as chisels, don't let tape measures rewind quickly into their cases.

Power Tools:

In the U.S. power tools are reasonably priced, especially when on sale. As with hand tools, the cheapest power tools wear out fast, lack power, and are not made well enough to do a good job. This is particularity true of saber saws. The cheapest ones do not have a well-made reciprocating mechanism and quickly wear out of alignment. They also have a hard time cutting even the softer woods. It is a good idea to buy power tools of good quality. This makes the learning tasks easier for students.

Eye Protection:

To protect your eyes, it is a good idea to wear safety glasses for any task where flying particles are generated by tools. The comfortable machinist's type safety glasses with side protectors are suitable for most tasks. For the lessons in this handbook, students who already wear glasses are sufficiently protected. Buy a good pair for every 2 students who don't already wear glasses. If safety glasses are uncomfortable, or have lenses that scratch easily, students may not wear them. If you cannot see through glasses because of scratches or dirt, they are not safe. Goggles or a full face shield should be used for more dangerous work (for example, lathe operation, drilling masonry, chiseling concrete). They can be worn over ordinary glasses.

Drill Bits:

Many different sizes of bits are needed for the lessons, and it is important for students to learn how to select the proper size bit for a task. Buy sets that have a durable storage case (a drill bit index) to prevent loss and so that students can easily see the different sizes.

Drill Bits (cont'd):

It is usually cheaper to buy sets of drill bits instead of the same number of individual bits. Be sure to buy extra replacement bits for the most commonly used sizes. For these lessons a set of 8 to 10 bits from sizes 1/16" to 1/4" is sufficient.

Soldering Irons:

Soldering irons come in many different styles. We recommend using the traditional style soldering iron or "pencil" type soldering iron, not "soldering guns," which are more expensive. For the kind of work done in these lessons, a small iron that can be easily held and maneuvered will be sufficient. Be sure to buy soldering irons that have replaceable tips. Buy extra tips to change when old tips wear out.

Straight Edges:

Straight edges and/or rulers are used frequently in the lessons. If students use straight edges as guides for cutting with razor knives, buy metal ones since a razor knife will cut plastic or wooden straight edges. Before you buy, decide if you need separate straight edges and rulers or just one tool for many tasks.

Wire Cutters and Long Nose Pliers:

When you buy these tools, be sure that the jaws (that cut wire or hold small objects) line up and come together properly. Before you buy, carefully inspect the jaws on a number of different tools and pick the ones that work best. This is very important if you buy reasonably priced tools. To make the tools last longer, don't use them on tasks for which they were not designed; for example, don't cut coat hangers with wire cutters designed for only cutting electrical wire.

BUYING MATERIALS

Buy materials in logical quantities (e.g. wire by the spool, batteries by boxes of 24, and screws by the pound). You can usually save 10-30%. (When shopping, compare the cost of items purchased in bulk with the cost of the same number of items if purchased individually.) It is better to buy extra materials or slightly more than you think you will need. Otherwise, you may have to return to the store for a few more items at a higher price. Whenever possible, buy the total quantity of an item needed for your chosen curriculum at one time. (See the Master Tools and Materials Lists for suggestions on how much to buy.)

Appendix: 4

STARTING SMALL

You may find that because of time, money or the numbers of students in your program you need to choose a smaller number of lessons. It's important that you do not compromise key educational objectives by cutting out lessons that provide foundations for subsequent ones. Here is a suggested way of building up the program by starting with a group of lessons that require a minimum of cost, effort of preparation and use of storage space. Language, of course will need to be readjusted.

The First Time

Drawing, Patterns and Electricity

2. Connecting Electrical Wire
3. Lines and Circles
4. Extension Cords
6. Designs
8. Measuring with String
9. Circuit with Bulb and Battery*
10. Reducing a Drawing
12. A Test Light*
16. Circuit with a Switch
17. Patterns for Cubes
18. Using Time Sheets
21. Designing Boxes
24. Making a Lamp (without PVC pipe)

*without soldering

The Second Time

Add PVC Pipe and Sawing Wood

1. Water Systems
13. Planning a Cutting Board
14. Sawing a Cutting Board*
15. Taking Inventory*
22. Plumbing Diagrams
24. Making a Lamp

*without a saber saw

The Third Time

Add Drilling Wood and Soldering

5. Using a Drill
7. Wire and Solder
9. Circuit with Bulb and Battery*
12. A Test Light*
20. Making a Terminal Board
23. Soldering Terminals

*with soldering

Whenever Possible

Add Sewing and Power Tools

11. Sewing Machine
14. Sawing a Cutting Board*
19. Sewing a Bag

*with saber saw

GETTING BIGGER

After you have accumulated enough tools and materials for teaching one class, you can expand the number of classes without having to buy duplicates of everything. Here are two ways to modify schedules to cut costs.

The first way is to schedule classes at different times. In the Panat Nikom program, classes were two hours in length. Each teacher taught two classes, either on a morning or an afternoon shift. The same tools and materials could then be used on both shifts.

A second way is to teach different lessons at the same time. The list that follows shows the lessons grouped by threes. The three lessons in a group usually use different tools and materials.

Unit 1

1. Water Systems
2. Connecting Electrical Wire
3. Lines and Circles

4. Extension Cords
6. Designs
7. Wire and Solder

5. Using a Drill
8. Measuring With String
9. Circuit With a Battery

10. Reducing a Drawing
11. Sewing Machine
12. A Test Light

UNIT 2

13. Planning a Cutting Board
16. Circuit With a Switch
17. Patterns for Cubes

14. Sawing a Cutting Board
18. Using a Time Sheet
20. Making a Terminal Board

15. Making a Terminal Board
22. Plumbing Diagrams
23. Soldering Terminals

19. Sewing a Bag
21. Designing Boxes
24. Making a Lamp

Only a few additional tools are needed to allow three classes to be taught simultaneously: 6 scissors, 6 rulers, 6 razor knives, and 2 wire cutters. No additional samples have to be prepared. Short life materials and handouts, however, are used in proportion to how many students you have.

Here's a sample of a schedule for the first three days:

	Jane's class	Tim's class	Marie's class
Monday	Water Systems	Connecting Electrical Wire	Line and Circles
Tuesday	Lines and Circles	Water Systems	Connecting Electrical Wire
Wednesday	Connecting Electrical Wire	Lines and Circles	Water Systems

If you teach a four-day week, it is convenient to have a review day on Thursday, and then begin the next group of three lessons the following Monday.

HOW TO USE THE MASTER LISTS

These lists provide information about all of the tools, materials, preparations and handouts needed for the lessons. You can use them as an aid in shopping, planning and preparing for lessons.

For every item, we have listed the lessons where the items are used and the maximum quantity per class size of 12 students. (We have not done this in the "Short Life Materials" section for the Activity lessons, because how much you use will depend on how you teach.)

After you have decided what lessons you plan to teach (see Getting the Most Out of Your Budget: Starting Small), you can use this information to figure out what supplies you will need. If your class size is bigger or smaller than 12, make the appropriate adjustments.

The only projects made of durable materials which the students keep are the cutting board and the cloth bag. If you also let them keep any of the electrical projects, you will need to replace these materials.

All materials that do not change as a result of being used in the lessons are listed under "Long Life Tools and Materials." Materials like plugs, sockets and plumbing parts can be used many times. Test lights and extension cords are on the "long life" list because after students have made them, they are used as tools in later lessons. Things that are used up, changed, wear out quickly or get lost (like masking tape, wire, sand paper, and paper clips) are listed under "Short Life Materials."

Long Life Tools and Materials — ACTIVITY LESSONS

Item	Maximum Quantity per class of 12	Used in Lesson
Adaptor (plumbing)	6	1
Back Saw (optional)	2	18, 20
Battery Holder, (for 2 1.5 volt batteries, with 1 red and 1 black wire)	12	9, 12
Bobbin	24	11, 19
Bottle	6	1
Bucket, Large	12	1, 22
Bucket, Small	6	1
"C" Clamp (6" or 8" size)	6	5, 14
Cassette Tape Player	1	18
Cassette Tape of Music	1	18
Clock with Second Hand	1	18
Compass	12	3, 6, 8, 13
Coping Saw, and Extra Blades (optional)	4	18, 20
Countersink Bit	2	5, 15
Electric Drill (optional)	1	5, 15
Extension Cord (student made in Lesson 4)	12	7, 9, 12, 14, 20, 23 24
Faucet, Brass	6	1, 22
Flexible Plastic Tube, Clear (1 cm. outside diameter)	18 meters	1
Food Cutting Knife	1	13

Appendix: 5

Long Life Tools and Materials (cont'd)

		ACTIVITY LESSONS
Item	Maximum Quantity per class of 12	Used in Lesson
Hack Saw, and Extra Blades	4	18, 20, 24
Hand Drill	12	5, 15, 20, 24
Hand Saw (10 or 12 point)	6	5, 13, 18
Hand Sewing Needles, Medium and Extras	12	11, 19
In-Cord Switch	6	24
Lamp	1	4
Light Bulb and Extras (2.5 volts, to fit socket)	12	4, 9, 12, 16, 23, 24
Light Bulb and Extras (40 watts)	6	24
Light Bulb Socket, for Lamp	6	24
Light Bulb Socket, Small (for 2.5 volts bulb)	12	9, 12
Long Nose Pliers	3	7, 9, 16, 20, 23
Metal File	1	7, 9, 12, 23
Orbital/Oscillating Sander (optional)	1	15
Pencil Sharpener	1	most Lessons
Philips Screw Driver (optional)	1	7
Pins, Package of 50	6	11, 19
Plug (with screw terminals)	18	4, 24
PVC Coupling	18	22, 24
PVC Elbow	30	22, 24

Long Life Tools and Materials (cont'd)

		ACTIVITY LESSONS
Item	Maximum Quantity per class of 12	Used in Lesson
PVC Elbow/Threaded Female Adaptor	3	22, 24
PVC Pipe; 1" diameter		22, 24
Long (40 cm.)	10	
Medium (25 cm.)	15	
Short (10 cm.)	20	
PVC Tee	18	22, 24
PVC Threaded Female Adaptor	6	22, 24
PVC Threaded Male Adaptor	6	22, 24
Rasps, 3-4 Varieties for Woodworking (see Woodworking Appendix)	12	14, 15
Razor Knife, and Extra Blades	12	2, 4, 7, 9, 12, 20, 21, 23, 24
Saber Saw, and Extra Blades	6	14, 18
Safety Glasses	6	14, 23
Scissors	12	8, 10, 11, 17, 19, 21
Screwdriver, Medium	12	2, 4, 5, 14, 16, 20, 23, 24
Screwdriver, Small	6	5, 14, 24
Set of Drill Bits (sizes 1/16" - 1/4" and Extra Bits)	6	5, 15, 20, 24
Sewing Machine	6	11, 19
Sewing Machine Needles and Extras	36	11, 19

Appendix: 5

Long Life Tools and Materials (cont'd) ACTIVITY LESSONS

Item	Maximum Quantity per class of 12	Used in Lesson
Socket, Multiple Plug Type for End of Extension Cord	12	4
Soldering Kit:	1	7, 9, 12, 20, 23
Soldering Iron	12	
Soldering Iron Holder	12	
Solder (box)	4	
Flux (container)	4	
Sponge (wet in a container)	4	
Tool to tighten tip	1	
Extra Tips	6	
Square, Carpenter's	6	5, 13, 20
Straight Edge/Metric Ruler	12	3, 6, 8, 10, 11, 13, 15, 17, 19, 20, 21
Switch, "Double Pole-Double Throw" with 6 terminals	4	16
Switch with 2 screw terminals, various types	12	16
Tape Measure, Metric	3	24
Tee (plumbing)	6	1
Test Light (students made in Lesson 12)	12	16, 23, 24
Threaded Pipe for Light Bulb Socket (3/8" x 3")	6	24
Timer/Stop Watch (optional)	1	22
Tracing Wheel	6	11, 19
Valve, Shut Off (Brass)	2	22
Wire Cutter	3	2, 4, 7, 9, 12, 20, 23, 24

Short Life Materials

ACTIVITY LESSONS

Item	Used in Lesson
Battery (1.5 volts, to fit battery holder)	4, 9, 12, 16, 23, 24
Bell Wire	2, 7, 9, 12, 16
Carbon Paper (8½" x 11")	13, 21
Cloth (cotton)	11, 19
Eraser, Gum Type	most Lessons
Glue (in a container)	21
Glue Applicator (wooden popsicle stick)	21
Lubricating Oil, Fine Grade	11, 14, 19
Magic Marker	8
Masking Tape	5, 8, 17, 22
Masonite	20
Newsprint Paper	8, 11
Paper Clips	21
Pencil	most Lessons
Plain Paper (8½" x 11")	3, 6, 9, 10, 16, 19, 24
Plastic Tape, Electrician's	2, 12, 24
Poster Paper	8, 21
Rubber Bands	20
Sand Paper (coarse, medium, fine)	15
Scrap Wood (small blocks)	5, 14, 15

Appendix: 5

Short Life Materials (cont'd) ACTIVITY LESSONS

Item	Maximum Quantity per class of 12	Used in Lesson
Screw and Nut (1½-2½ cm. long)		20
Screw, Flathead Wood (3 cm. long)		5
Snaps, Sew on Type		19
String, Thick, Non-Stretching		8, 15
Terminal (soldered type)		20
Thread (spool)		11, 19
Tracing Paper (package) (for sewing and use with tracing wheel)		11, 19
Vegetable Oil		15
Washers, (to fit screw)		20
Wood Boards:		
(2 cm. thick x 6.5 cm. wide)		2, 5
(2 cm. thick x 18.5 cm. wide)		5, 13

Preparations

Item	Maximum Quantity per class of 12	Used in Lesson
Box with Flaps	1	21
Cube	2 small 1 large	17
Rectangular Box, 2 Shapes	2	21
Bench Hook/Table Protection (possibly) made in Lesson 5	12	5, 7, 9, 13, 20, 21, 24

Preparations (cont'd)

Item	Maximum Quantity per class of 12	ACTIVITY LESSONS Used in Lesson
Cardboard Shapes	60	6, 10
Cloth Bag	1	19
Coupling	15	1
Cutting Board	2-3	13
Extension Cord (students made in Lesson 4)	1	4
Paper Hat	3	8
Paper Square, 10 x 10 cm.	11	22
Pattern for Cloth Bag	13	19
Sanding Block (approx. 2 x 6.5 cm. x 9 cm.)	6	15
Terminal Board	3	20, 23
Test Light	1	4, 12
Wood Blocks Screwed Together	2	5
Wood Block with 2 Sheet Metal Screw Terminals	12	2

Handouts*

Card Board Shape Designs		6, 10
Cutting Board Grid Paper:		
Designing a Cutting Board	12	13
Enlarged Cutting Board Design	12	13
Sample Cutting Board Design	1	13

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*All Handouts available in the Appendix

Appendix: 5

Handouts* (cont'd)

ACTIVITY LESSONS

Item	Maximum Quantity per class of 12	Used in Lesson
Forms:		
Insulator/Conductor	12	12
Time Card	12	18
Timing a Task	12	18
Tools and Materials Inventory	12	15
Grid Paper:		
1.5 cm. Squares	24	10
2 cm. Squares	24	10
3 cm. Squares	36	17, 21
Plumbing Diagrams (6 diagrams)	2 sets	22
Practice Penmanship Paper		optional
Tool Diagrams	32	various Lessons

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*All Handouts available in the Appendix

Long Life Tools and Materials

NUMBER LESSONS

Item	Maximum Quantity per class of 12	Used in Lesson
Bathroom Scale	1	33
Bottle Cap	200	2, 3, 16, 23, 25, 28
Calculator	12	1, 6, 8, 11, 18, 23, 28, 31
Clothes Pin	9	12
Coins (with container):		
Penny	50	30, 32
Nickel	40	30, 31, 32
Dime	30	30, 31, 32
Quarter	24	30, 31, 32
Cuisenaire Rods, Large Box	2	8, 11, 13, 15, 17, 20, 34
Dice	2	5
Dollar Bill	20	31, 32
Extension Cord*	1	9
Glass Jar, Large	1	18, 23
Hand Drill*	3	7
Magic Marker*	2	29, 33
Meter Stick	6	29
Metric Ruler (cm. only)	3	19
Nails, 1 lb. box	1	12
Pencil Sharpener*	1	19
Plug * (for extension cord)	2	9

---

*also used in Activity lessons

Appendix: 5

Long Life Tools and Materials		NUMBER LESSONS
Item	Maximum Quantity per class of 12	Used in Lesson
Scissors*	2	13
Screwdriver*	3	7, 9
Socket* (for extension cord)	2	9
Straight Edge/Metric Ruler*	12	4, 8, 11, 19, 26
Student-Made Ruler (made in Lesson 13)	12	15, 19, 22
Tape Measure (inches)	1	29
Tape Measure (metric)	3	26
Wire Cutter*	1	12
Short Life Materials		
Candy (individually wrapped pieces)	40	18
Chalk (white)	4	27, 33
Chalk (3 other colors)	3	27
Eraser	12	various Lessons
Masking Tape	1	19, 33
Newsprint, Sheet	4	33
Paper Cup	10	10, 12
Pencil	12	various Lessons
Plain Paper, 8½" x 11"		various Lessons

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*also used in Activity lessons

Preparations

NUMBER LESSONS

Item	Maximum Quantity per class of 12	Used in Lesson
Bottle Caps, Black	80	21, 24
Bottle Caps, Red	80	24
Bottle Caps, White	40	21
Bottle Caps, Yellow	50	24
Cardboard Circles (with 2 parts, 5 parts, 10 parts)	3	14
Demonstration Ruler, Millimeter/Centimeter	1	19
"Equals" Symbol Card	2	5, 21, 24, 28, 30
Grid On Blackboard	1	27
Lamp Cord (1-2 meters long)*	1	9, 12
Number Flash Cards, 1-6	3 sets	5, 14, 17
Number Flash Cards, .1-.9	1 set	14, 17
Paper Strips (see Number Lesson 22 for specifications)	20	22
Pitcher Of Water	1	10, 12
"Plus" Symbol Card	1	28
Poster Paper (marked into strips)	1	13
P.V.C. Pipe, 23 cm. long	1	18, 11
Spinner Board (see Lesson 2 for specifications)	2	2, 3, 16, 17, 20, 21, 24, 25, 27, 28, 30, 31, 32

---

*also used in Activity lessons

Appendix: 5

Preparations

Item	Maximum Quantity per class of 12	Used in Lesson
Spinner Cards		
#1	1	2, 21, 24
#2	2	3, 27, 28,
#3	1	16
#4	2	17, 20
#5	1	25
#6	1	27
#7	1	27
#8	1	30, 31
#9	1	32
Wood, (2 x 5 cm. x 42 length)	1	8, 11

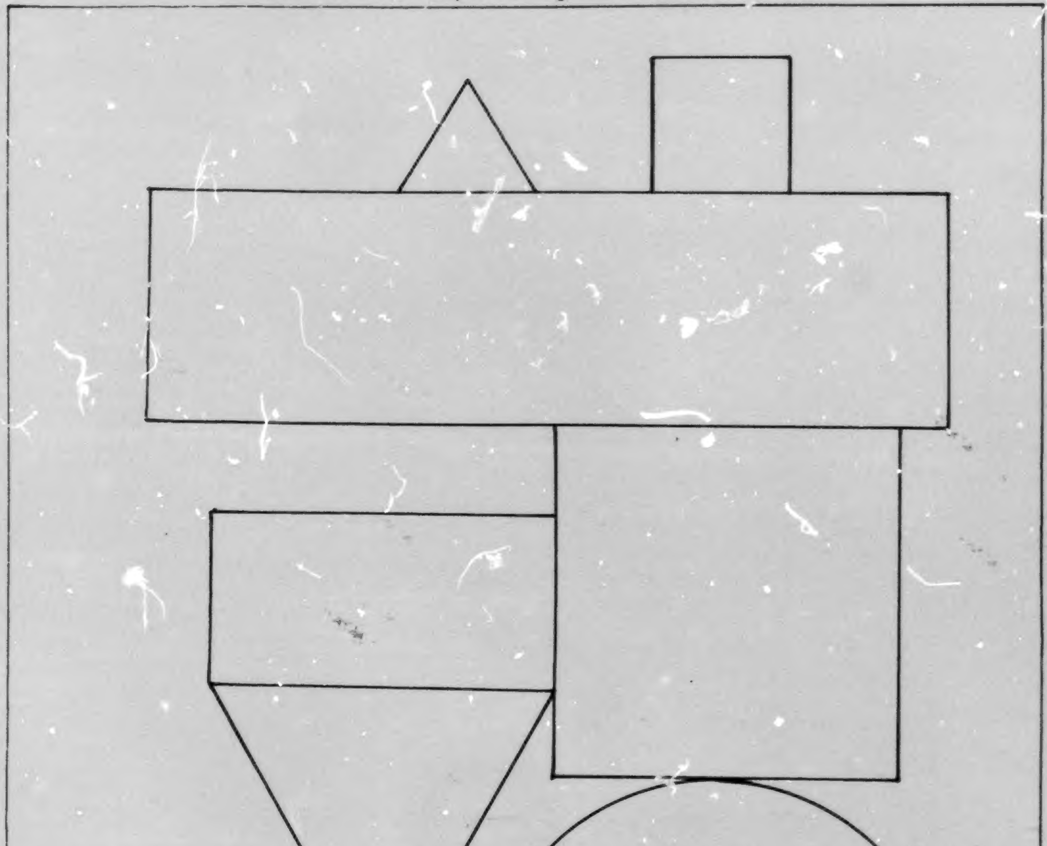
Handouts *

"Follow the Number" Drawings (6 drawings)	12 sets	4
Measurement Form	12	8

*All Handouts available in the Appendix

Appendix: 6

Card Board Shape Designs, Lessons 6; 10



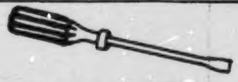
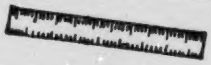
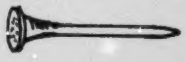
Appendix 6

Grid Paper: 1.5 cm. Squares, Lesson 10

Grid Paper: 2 cm. Squares, Lesson 10

Appendix: 6

Insulator/Conductor Form, Lesson 12

	INSULATOR	CONDUCTOR
 SCREWDRIVER		
PENCIL		
BOTTLE		
P.V.C. PIPE		
SQUARE		
 RULER		
TAPE		
WIRE		
FUSE		
 NAIL		
PAPER		

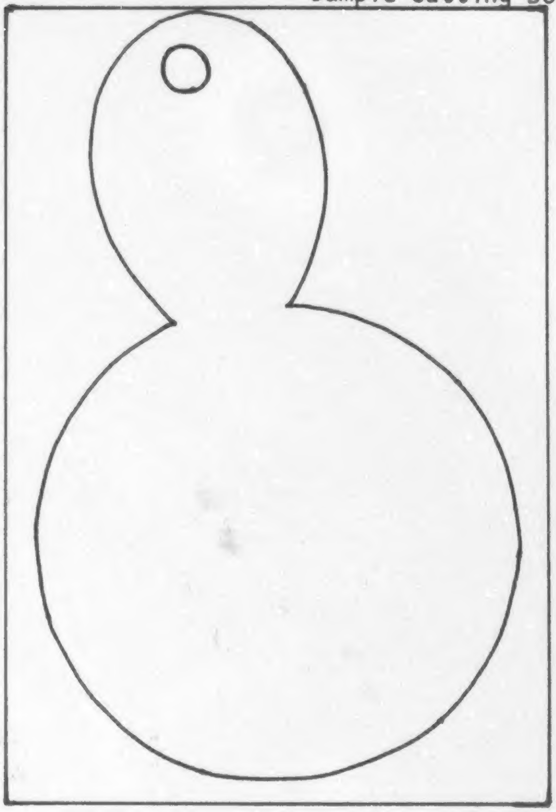
Designing a Cutting Board, Lesson 13

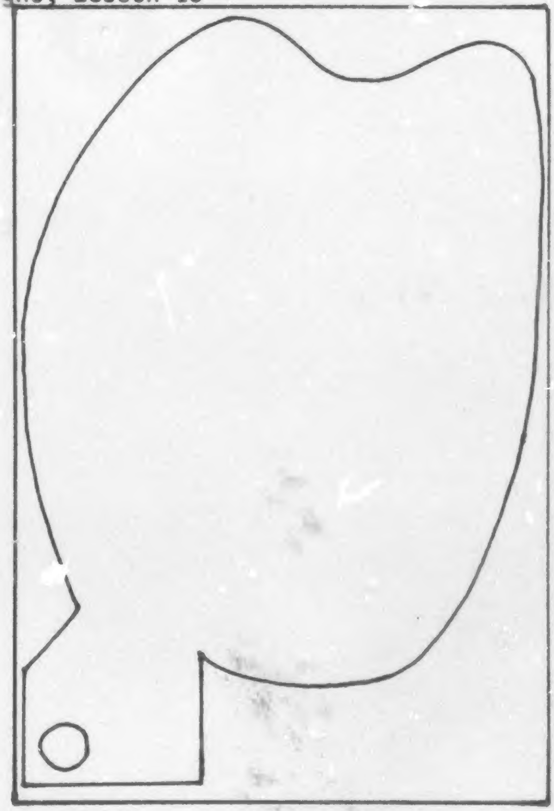
Appendix: 6

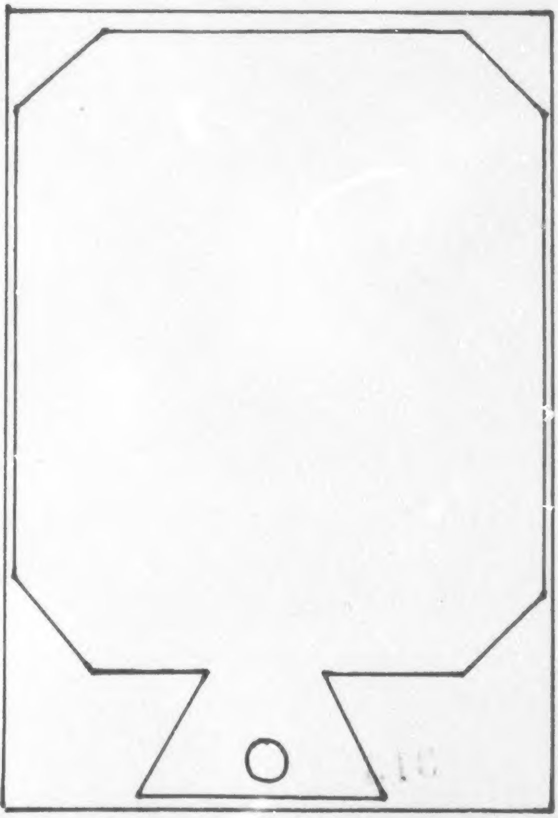
Enlarged Cutting Board Design, Lesson 13

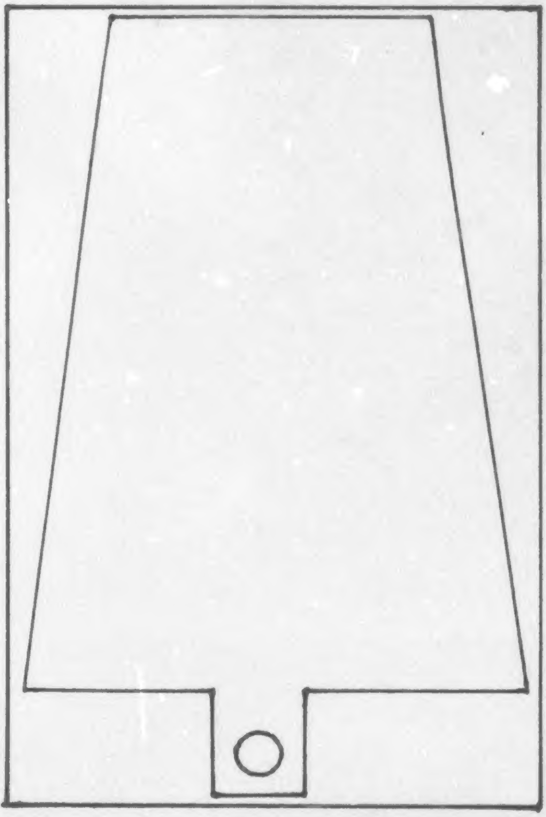
Appendix: 6

Sample Cutting Board Designs, Lesson 13









Appendix: 6

Tools and Materials Inventory Form, Lesson 15

TOOLS/MATERIALS	CHECK OUT (OUT OF SUPPLY ROOM)	MATERIALS ROOM A=ADD C=CHANGE	CHECK IN (INTO SUPPLY ROOM)	BROKEN

Appendix: 6

Grid Paper: 3 cm. Squares, Lessons 17, 21

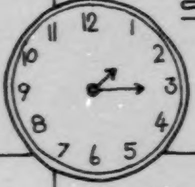
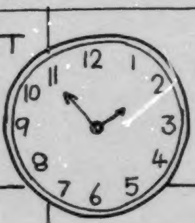
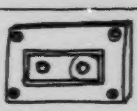
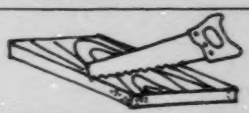
Appendix: 6

Time Card, Lesson 18

NAME (PRINTED)			
DATE	IN	OUT	NAME (SIGNATURE)
MON.			
TUE.			
WED.			
THUR.			
FRI.			

Appendix: 6

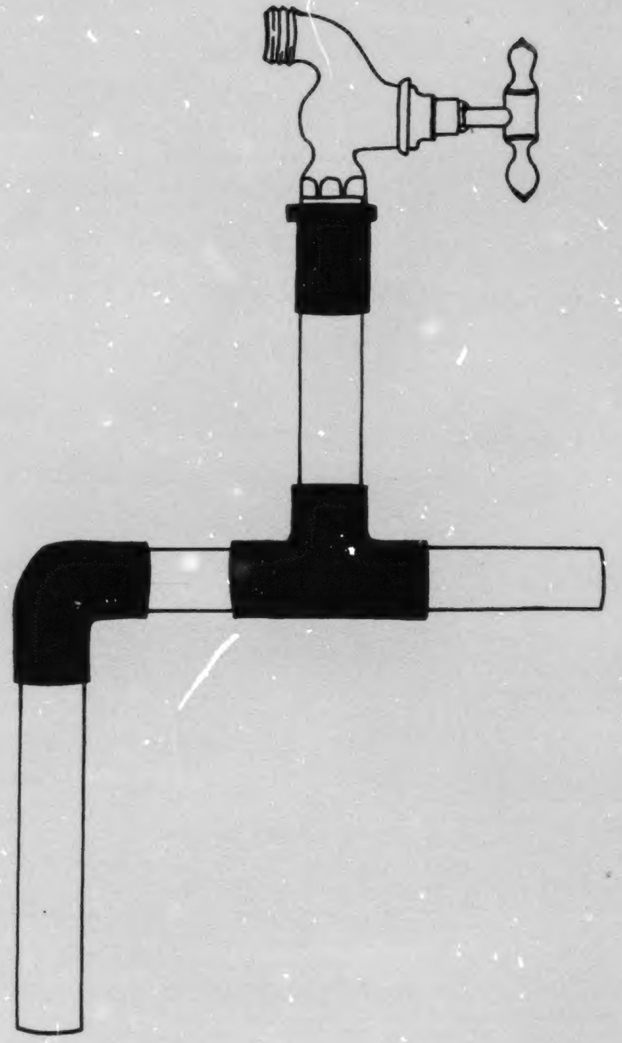
Timing a Task, Lesson 18

TASK	START 	STOP 
	1:15	1:55
		

Appendix: 6

Plumbing Diagrams, Lesson 22

#1



Plumbing Diagrams, Lesson 22

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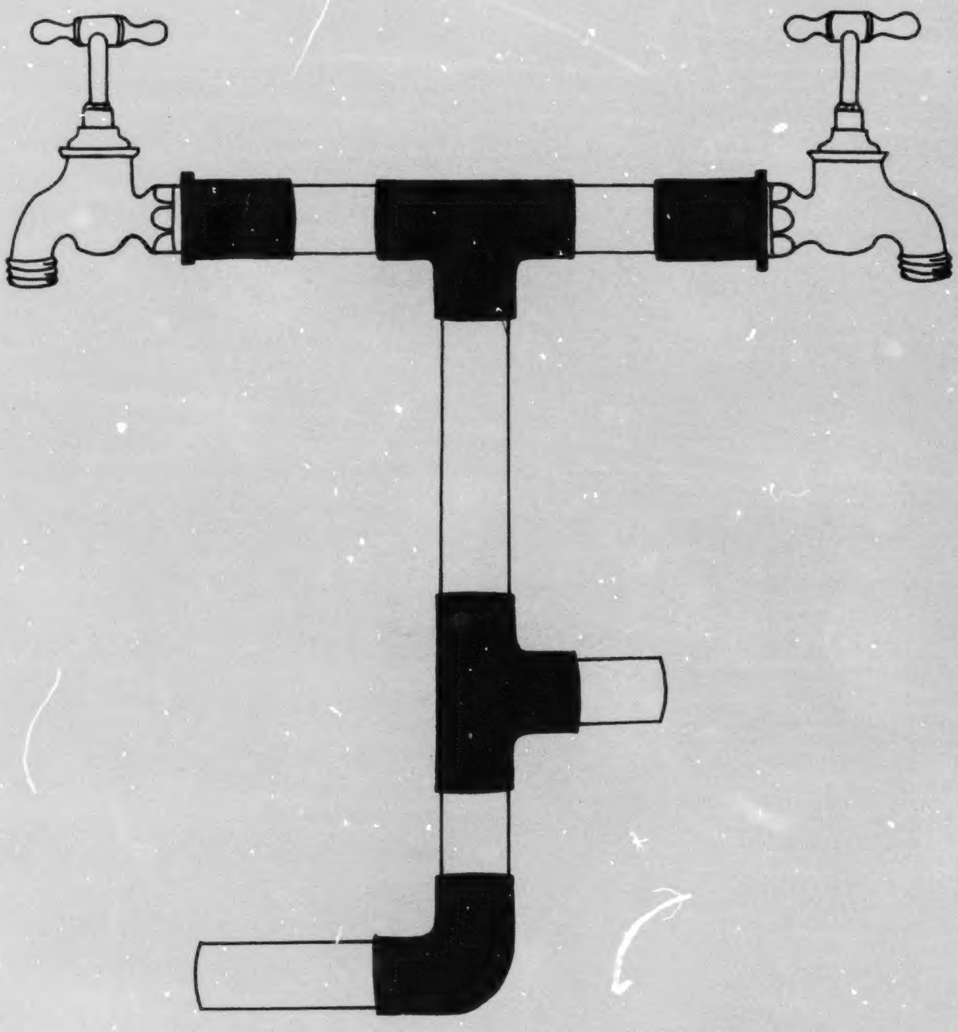
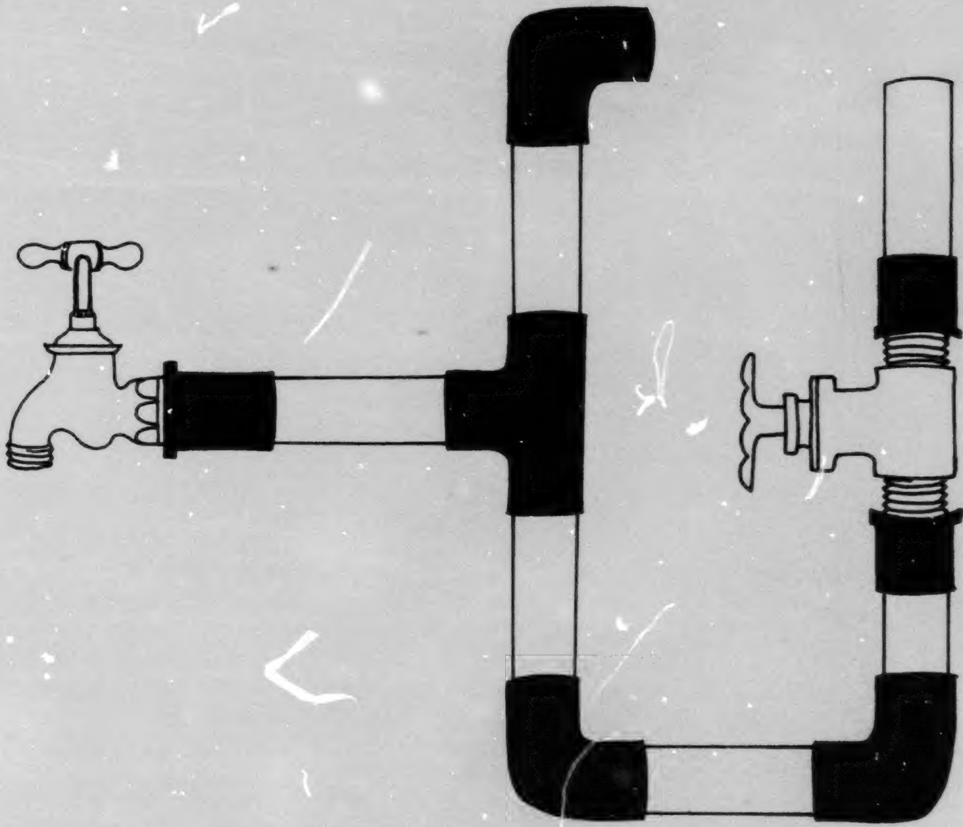


Appendix: 6

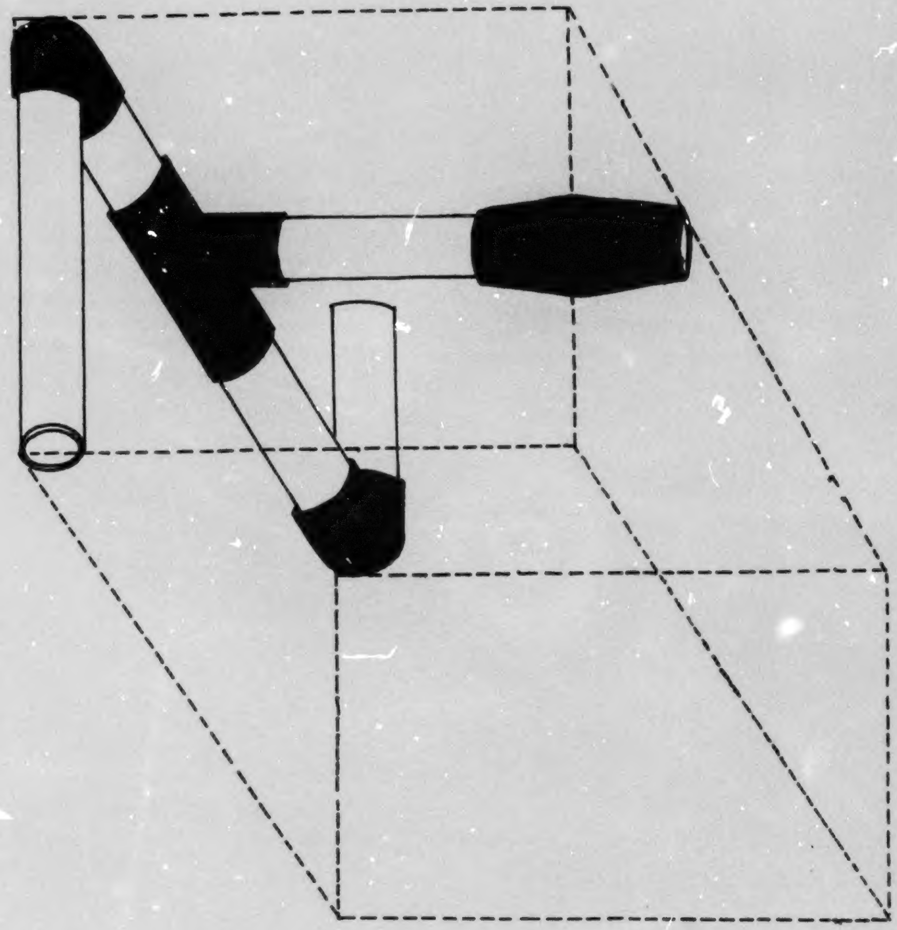
Plumbing Diagrams, Lesson 22

#3



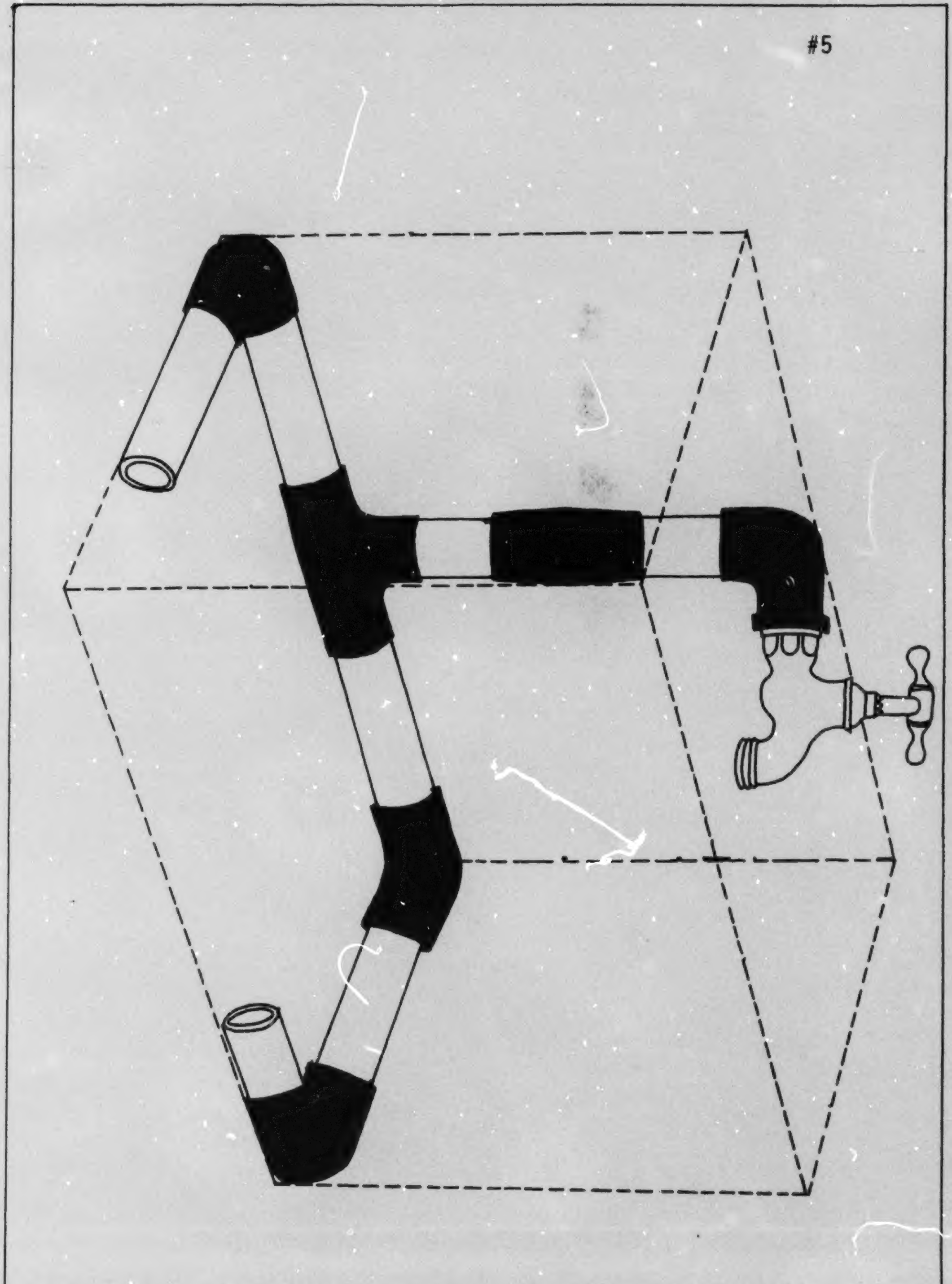
Plumbing Diagrams, Lesson 22

#4



Appendix: 6

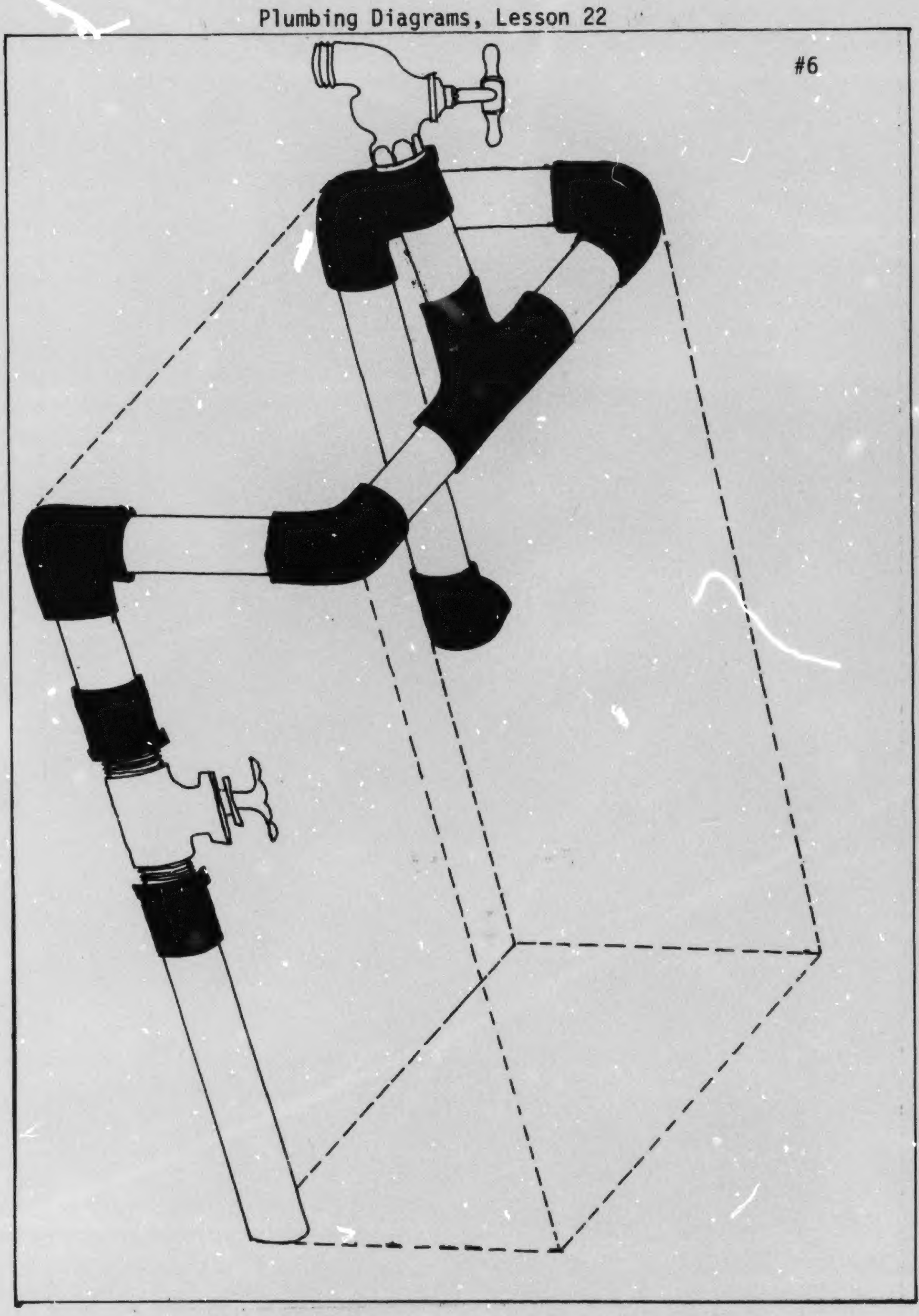
Plumbing Diagrams, Lesson 22



323

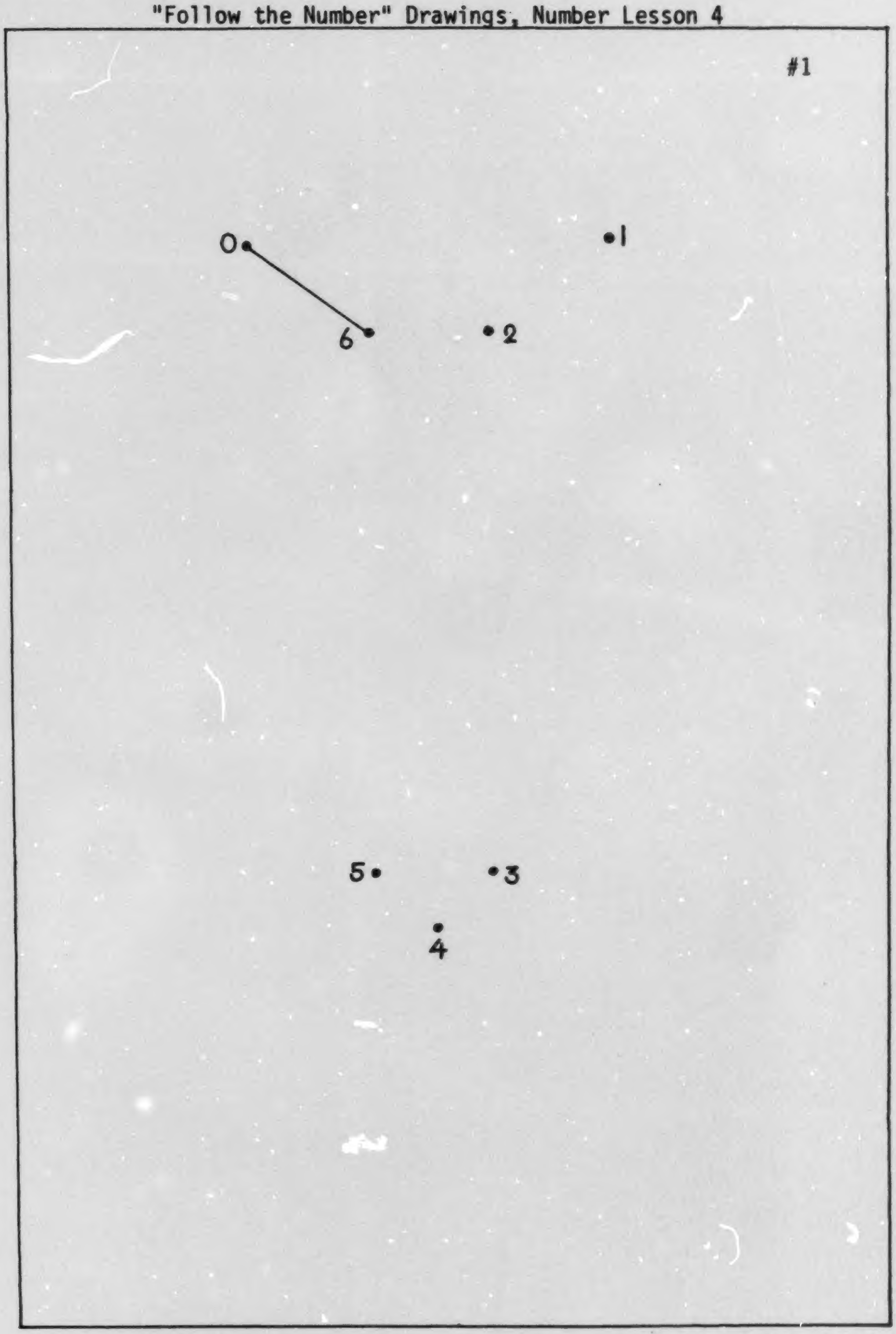
Plumbing Diagrams, Lesson 22

#6



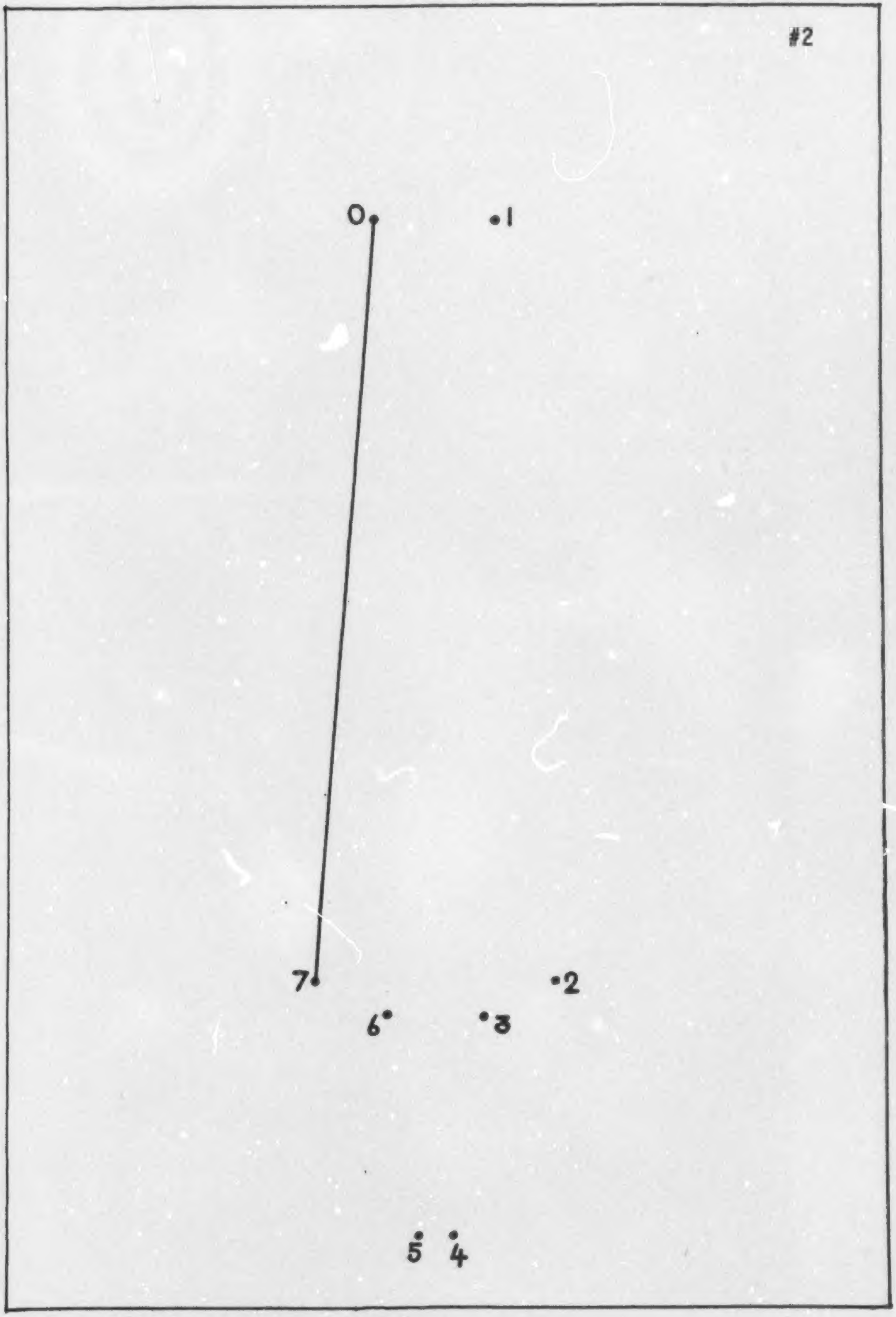
Appendix: 6

"Follow the Number" Drawings, Number Lesson 4

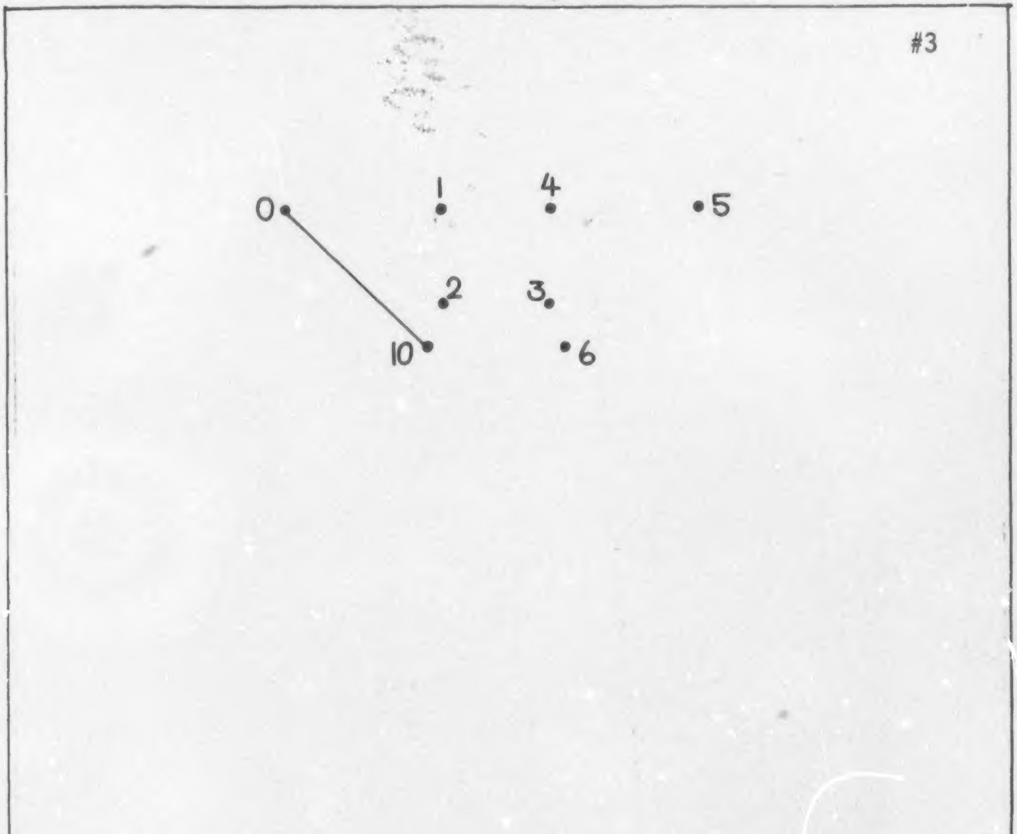


Appendix: 6

"Follow the Number" Drawings, Number Lesson 4



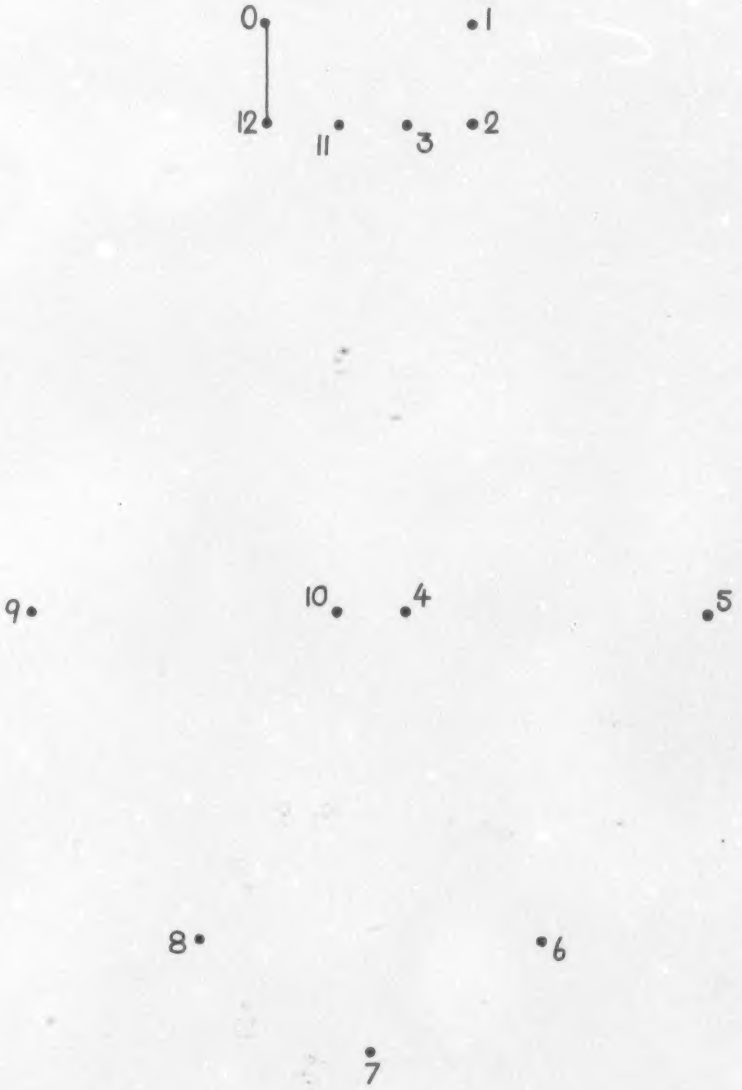
"Follow the Number" Drawings, Number Lesson 4


#3
0
1
2
3
4
5
6
7
8
9
10

Appendix: 6

"Follow the Number" Drawings, Number Lesson 4

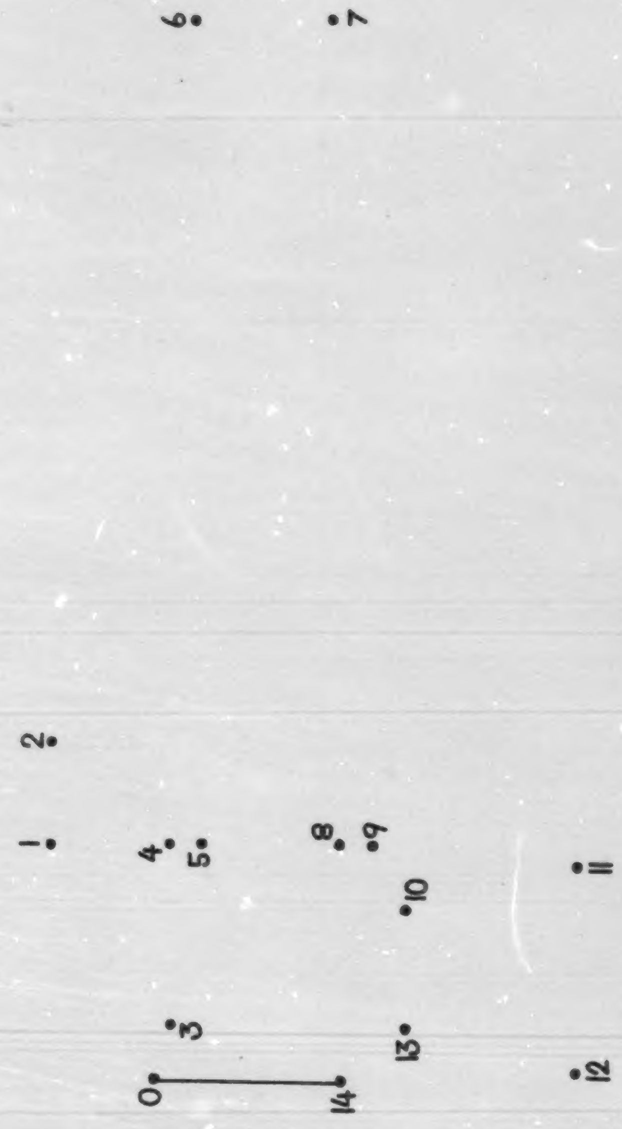
#4


0
1
12
11
3
2
9
10
4
5
8
6
7

Appendix: 6

"Follow the Number" Drawings, Number Lesson 4

#5


0
1
2
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6
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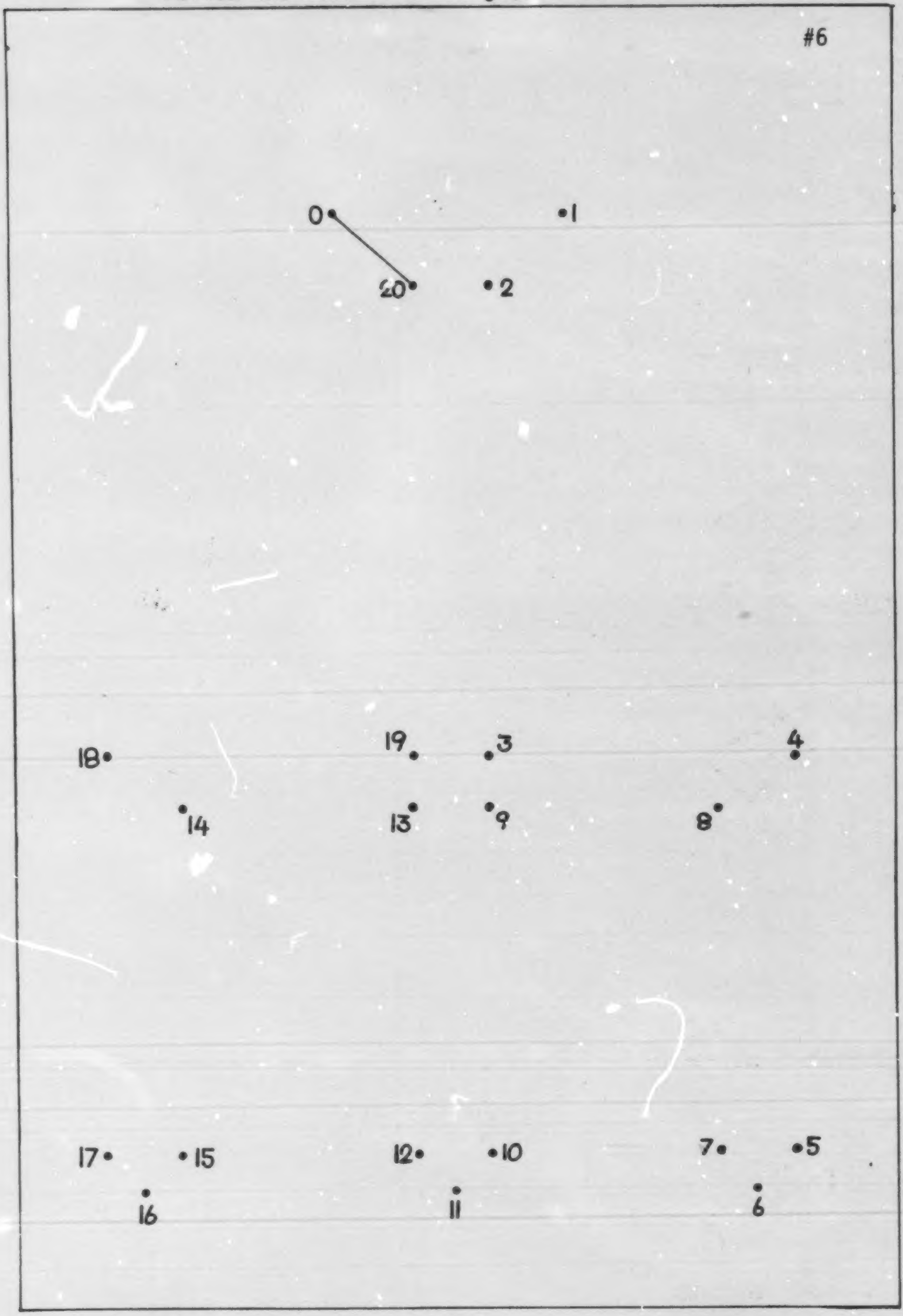
8
9
10
11
12
13
14

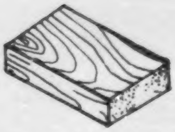
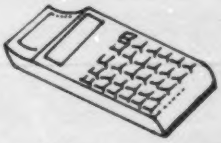
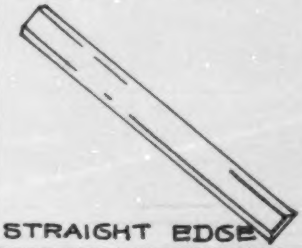
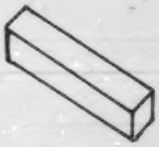
Appendix: 6

"Follow the Number" Drawings, Number Lesson 4


#6
0
1
20
2
19
3
4
18
14
13
9
8
17
15
12
10
7
5
16
11
6

Appendix: 6

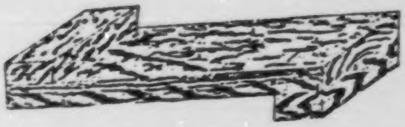
Measurement Form, Number Lesson 8

OBJECT	ORANGE BLOCK	WHITE BLOCK	WHITE BLOCK ONLY
P.V.C. PIPE			
 PIECE OF WOOD			
 CALCULATOR			
 STRAIGHT EDGE			
 ORANGE BLOCK			

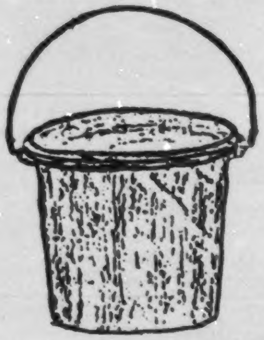
Appendix: 6

Tool Flashcard Cut-Outs

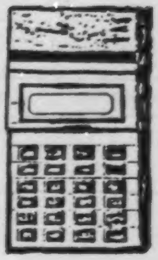
BENCH HOOK



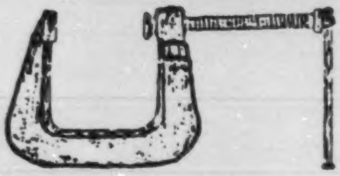
BUCKET



CALCULATOR

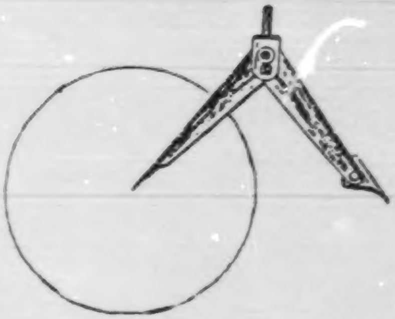


CLAMP

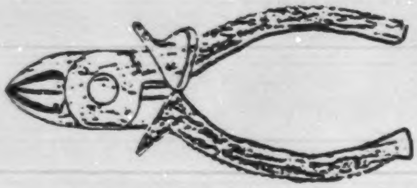


"C" CLAMP

COMPASS



CUTTER

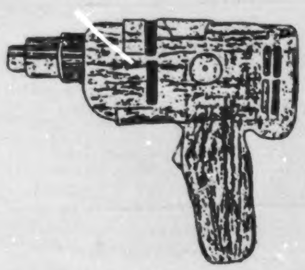


Appendix: 6

Tool Flashcard Cut-Outs

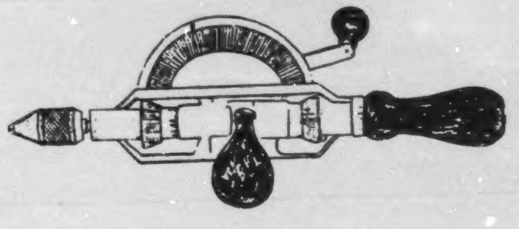
DRILL

ELECTRIC DRILL

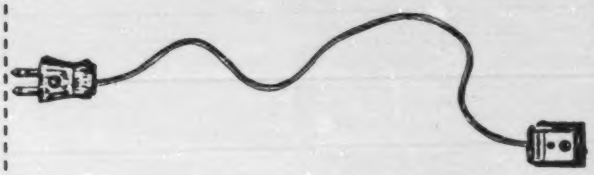


DRILL

HAND DRILL

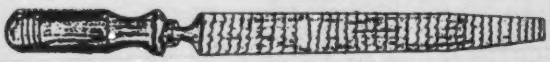


EXTENSION

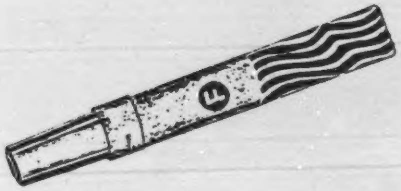


EXTENSION CORD

FILE

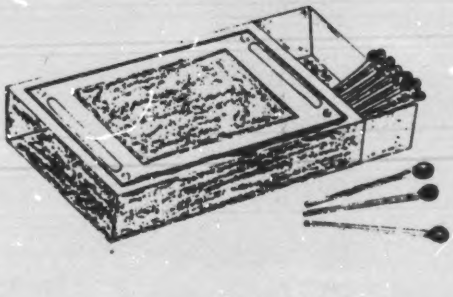


MARKER



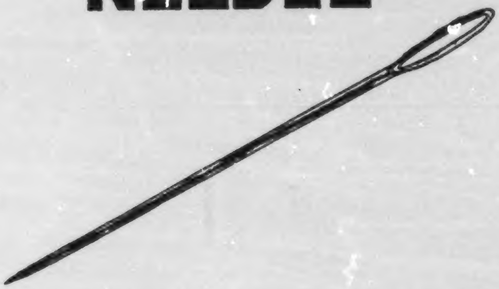
MAGIC MARKER

MATCHES

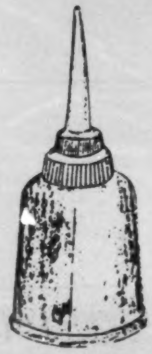


Tool Flashcard Cut-Outs

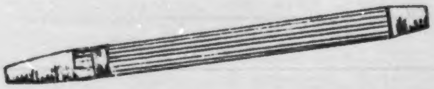
NEEDLE



OIL CAN

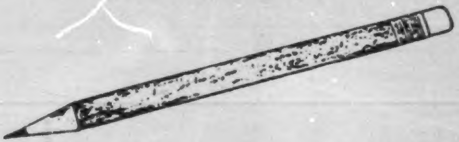


PEN

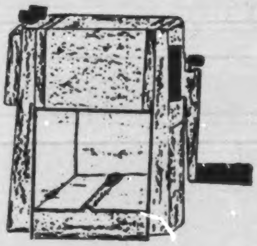


FELT PEN

PENCIL



PENCIL SHARPENER



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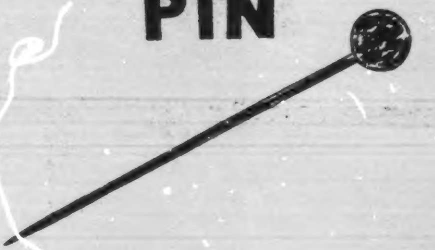
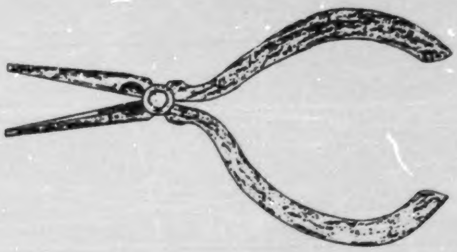


Appendix: 6

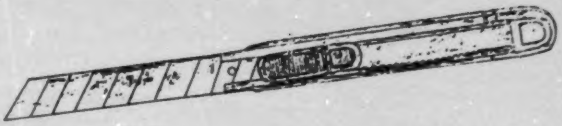
Tool Flashcard Cut-Outs

PLIERS



LONG NOSE PLIERS

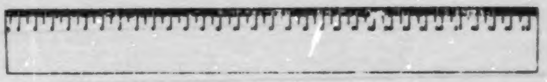
RAZOR



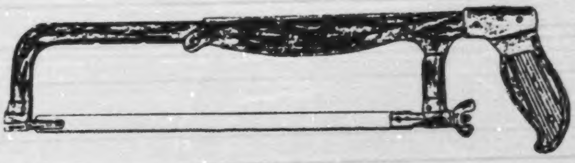
RAZOR KNIFE

ROD

RULER

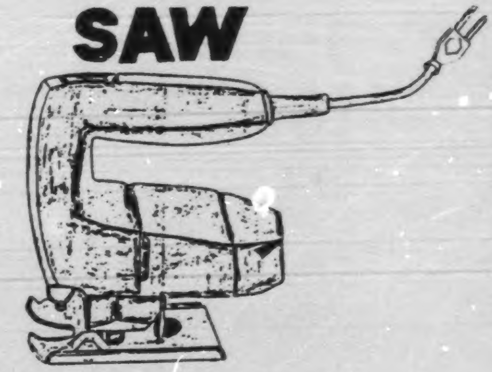


SAW



HACKSAW

SAW

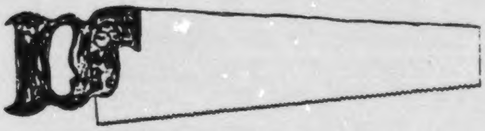


SABER SAW

Appendix: 6

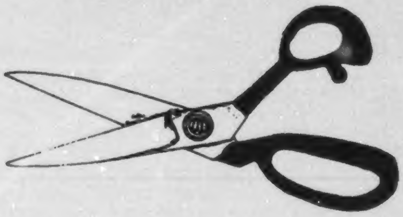
Tool Flashcard Cut-Outs

SAW

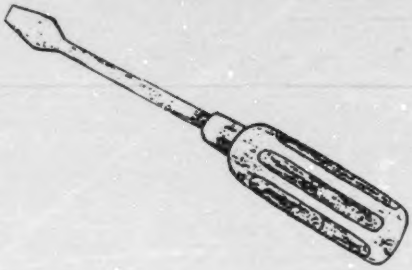


WOOD SAW

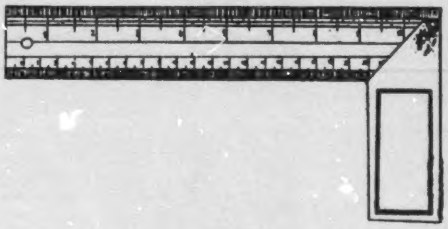
SCISSORS



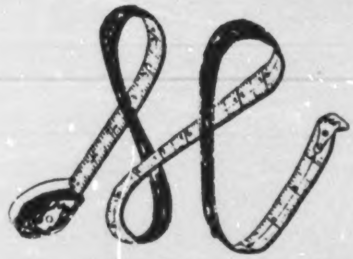
SCREWDRIVER



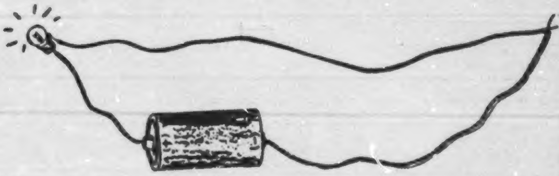
SQUARE



TAPE MEASURE



TEST LIGHT



Appendix 6

Practice Penmanship Paper